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How do Firms Respond to Political Tensions? Evidence from Chinese Food Importers

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Keywords

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Disciplines

Economic Policy | International Economics | International Relations | Political Economy

How do Firms Respond to Political Tensions?

Evidence from Chinese Food Importers¹

Haoran Li² and Xibo Wan³ and Wendong Zhang⁴

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JEL Codes: F51, F14, P33, Q17, Q18

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1 INTRODUCTION

Rising nationalist sentiments are raising political tensions across the world—U.S. President Donald Trump seeks to “make America great again,” China’s President Xi Jinping calls for “the great rejuvenation of the Chinese nation,” and France’s Emmanuel Macron is trying to restore France’s glory through his “Jupiterian” presidency, all while a majority of Britain’s citizens voted to leave the European Union to take back control. In a more globalized world, political tensions do not necessarily evolve into wars, but rather manifest as a trade dispute. In other words, political tensions continue in the regime of trade. As such, nationalist and strong-state narratives create risks for political tensions internationally, which creates significant uncertainty for global trade. As of October 2020, the trade war between the United States and China has lasted for over two years with no sign that it will end soon—the political relation between these two countries is quickly deteriorating. In addition, the quarrel between Australia and China over Hong Kong and the origin of COVID-19 led to China banning barley from Australia’s largest barley exporter in September 2020 (Zhang, 2020). Furthermore, a military confrontation between India and China led to India banning nearly 200 mobile apps from China. The International Money Fund’s World Trade Uncertainty Index shows that these political tensions contributed to a recent sharp rise in trade uncertainty over the past few years after two decades of stability, threatening global trade and economic growth (Ahir et al., 2019).

Many previous studies analyze the relationship between trade and political tensions (Berger et al., 2013; Che et al., 2015; Davis and Meunier, 2011; Head et al., 2010; Long, 2008; Michaels and Zhi, 2010). Davis and Meunier (2011) argue that, theoretically, political tensions should play a smaller role in a more globalized world; however, several recent empirical studies (Du et al., 2017; Fuchs and Klann, 2013; Heilmann, 2016) show that political tensions still exert significant negative impacts on trade. There are two critical gaps in the current literature. First, most previous studies focus on short-term political tensions that last for days or months, such as consumer boycotts (Heilmann, 2016; Pandya and Venkatesan, 2016). Except for the four-year sanction in Haidar (2017), the periods of political tensions examined in recent studies are mostly limited to two years at most (Crozet and Hinz, 2020).

As a result, many existing studies find trade responses to short-term political tensions are short-lived and sometimes driven solely by firms with stronger governmental ties. Second, most previous research relies on aggregate trade data to analyze the impact of political tensions, which masks firm-level trading behavior under political tensions. Recent papers (Ahn and Ludema, 2020; Crozet and Hinz, 2020; Haidar, 2017) utilize firm-level data to shed light on the effect of political tensions on individual firm's behaviors in sanctioned countries, such as Iran and Russia; however, how political tensions affect firms' trade practices and importing portfolio involving products from sanctioned countries remains unclear.

The objective of this paper is to examine how lasting political tensions impact firms' trading behaviors at both the extensive and intensive margins. In particular, we leverage detailed data on all Chinese seafood importers and importing trips against China's six-year sanction of Norwegian salmon products due to bilateral political tensions that started in 2010. Specifically, in October 2010, Norway's Nobel Committee awarded Chinese political dissident Liu Xiaobo a Nobel Peace Prize. Within months, China called for more stringent sanitation and veterinary testing of imports of chilled farmed salmon as a response to this "blasphemy" (Reuters, 2010). China's sanction lasted until 2016, when China negotiated a new health certificate for Norway's exports of fish products. Firms' responses to this sanction provide a unique opportunity to observe how political sanctions change firms' trading strategies over a long period. In particular, we explore three main research hypotheses. First, we hypothesize the sanctions had significant negative impacts on imports of Norwegian fresh salmon for firms that imported these products before the sanction, which provides an estimate of the magnitude of the intensive-margin impacts of political sanctions on Norwegian fresh salmon importers. Second, we hypothesize that long-lasting political sanctions reshape firms' trading strategies. In our case, impacted firms possibly looked for fresh salmon from other countries or shifted to other seafood products, depending on whether the benefit of transition outweighed the costs of not doing so. Importantly, we examine whether long-lasting political tension made firms strategically diversify their trade portfolios. Lastly, we hypothesize these intensive and extensive margin responses could vary

by firm characteristics, with greater responses for firms with better resources and existing alternative trading routes.

Our main identification strategy is the widely used event study approach (e.g., Allcott and Rogers (2014); Gallagher (2014); Markevich and Zhuravskaya (2018)) in which we leverage China's prompt sanctions following the 2010 Nobel Peace Prize announcement. We combine this with firm-level data from China Custom Database, which provides price, value, and source country information for all 74,221 salmon import transactions for China's seafood importers from 2007 to 2015. Using firms importing North American shrimp as the control group, we first quantify the salmon sanction's intensive-margin impacts and their persistence over time on the import outcomes of Norwegian fresh salmon for most affected firms that imported these products before 2010. Second, we examine three extensive margin outcomes due to the political sanction—the number of countries a firm imports fresh salmon from, the maximum import share of fresh salmon from any country, and the import quantity of other seafood products. We expect to see trade diversion effects as firms actively seek other importing source countries and non-sanctioned substitute products. In addition, the maximum fresh salmon import share also captures a strategic diversification effect where political sanctions make firms less likely to solely depend on any particular country. Finally, we employ a generalized triple difference design to examine the heterogeneous response across firm characteristics such as firm type, firm size, and existing trading routes.

The validity of our event study design hinges on the assumption that Norwegian fresh salmon imports and North American shrimp imports have similar trends absent the sanction. We provide several pieces of evidence to show that the parallel trends assumption is satisfied. In addition, we follow Semykina and Wooldridge (2010) to first formally test for the sample selection bias due to some firms stopping fresh salmon imports altogether following the 2010 sanction, using the fixed effects two-stage least squares estimator. We then correct the selection bias using a parametric approach assuming the errors on the selection equation are normally distributed. Additionally, we provide suggestive evidence that our results are robust to alternative control groups, potential unobserved shocks,

and time-varying treatment effects. Finally, we use a partial-equilibrium model of firms' importing diversification behavior to rationalize our empirical findings.

Our results reveal that China's importing firms responded to the salmon sanction at both the extensive and intensive margins. Previous literature (Du et al., 2017; Fuchs and Klann, 2013) mainly focuses on the intensive margin at the national level. In our paper, by utilizing firm-level data, we are able to do a deeper analysis on the optimal importing behavior of agents under political tensions. At the intensive margin, firms importing Norwegian fresh salmon before the sanction saw a consistent and dramatic decline in their imports of fresh salmon products from Norway ranging from 89% to 96%. Furthermore, the declines were not short-lived, but instead remained persistent throughout the six-year political sanction. At the extensive margin, we not only find a trade diversion effect where firms import from other countries and fewer firms import fresh salmon from Norway, but also a permanent "political hedging" effect with a decline in the maximum import share from any particular country, even if it is not Norway. In particular, we find that the maximum share of seafood a firm imports from any country decreased by 20% on average, especially for firms with pre-existing alternative trade routes other than Norway. Furthermore, we find a shift from Norway dominating import market shares to other countries, especially the Faroe Islands and the United Kingdom, accounting for more import market share. Furthermore, we find a greater decline in Norwegian fresh salmon imports for firms that have existing seafood trading routes other than Norway, but we do not see any significant changes in Norwegian frozen salmon imports. The firm-level analysis reveals that long-term political tensions between China and Norway made China's importers adopt the strategy of import diversification in order to compromise the negative impacts from a poor long-term bilateral relationship.

Our paper makes three contributions to the literature on the interplay between trade and political tensions. First, our work contributes to the extensive literature that examines the effectiveness of political tensions on trade and economic growth outcomes (Besedeš et al., 2017; Che et al., 2015; Du et al., 2017; Frankel, 1982; Fuchs and Klann, 2013; Heilmann, 2016; Hufbauer et al., 2003; Irwin, 2005; O'rourke, 2007; Pandya and Venkatesan, 2016).

Previous studies often use datasets aggregated at the national level to investigate the effects of deteriorating political relations. These studies mainly focus on short-lived political tensions and conclude that political tensions only have temporary effects on trade (Crozet and Hinz, 2020; Fuchs and Klann, 2013; Heilmann, 2016; Michaels and Zhi, 2010; Pandya and Venkatesan, 2016). In particular, except for Haidar (2017), which examines the impact of Iran sanctions from 2008 to 2011 on Iran exports, the political tension period of these studies ranges from several months to just more than one year. In contrast to the existing literature, our work looks at the six-year China-Norway political dispute and leverages the firm level data from China Custom data to examine the effect of the lasting political tension on bilateral trade outcomes. We show that the long-term political sanction had lasting and substantial impacts on firms' imports, a dramatic 89%-96% decline in fresh salmon imports from Norway, as opposed to the short-lived or muted responses documented in the literature.

Second, while notably scarcer, there is increasing evidence of the impact of economic sanctions on firms' decisions and trade practices (Ahn and Ludema, 2020; Baker et al., 2016; Bloom, 2009; Crozet and Hinz, 2020; Haidar, 2017; Handley and Limao, 2017; Jia, 2008). In particular, recent studies have used firm-level data to quantify the effect of sanctions on Iran or Russia using various economic outcomes. Haidar (2017) focuses on the Western-imposed sanctions on Iran in 2008 and finds, in the setting of a strict embargo, Iranian firms had heterogeneous responses to the export sanctions where larger firms were more likely to divert exports to non-sanctioning countries. In addition, Crozet and Hinz (2020) finds that exports to Russia saw a steep decline following the sanctions on the Russian Federation over the 2014 conflict in Ukraine, and the bulk of the decline is actually from non-embargoed products, reflecting elevated perceived political risk. Both Crozet and Hinz (2020) and Ahn and Ludema (2020) provide evidence that the sanctions have a spillover effects on non-sanctioned products.

In contrast to these studies, our results indicate a reduction in maximum import share from any country even if their main importing source country is not affected by the sanction. This shows that the lasting political sanction resulted in strategic political hedging behavior

where firms become precautionary and proactively expand their importing partners. To the best of our knowledge, this outcome has not been examined before the context of political tensions and trade, and it demonstrates the long-term impact of political tensions on firms' trading portfolio and strategies. This is consistent with the findings of our partial-equilibrium model of firms' importing diversification behavior where some firms continue to import from new trading partners even after the Sino-Norway relations unfroze in 2016. In other words, The lasting political tensions has fundamentally changed importers' diversification strategy and permanently changed the trade patterns with Norway playing a diminished role. We provide evidence that the Norwegian fresh salmon imports didn't fully recover two years after normalization of the bilateral relationship.

Finally, this paper also relates to a strand of literature that investigates the politically influenced firms' behavior under political tensions (Du et al., 2017; Heilmann, 2016; Lin et al., 2019). These studies look at the impact of political tensions on political influenced firms and find these firms display the higher sensitivity of imports to political relations relative to other type of firms. In our context, our heterogeneity analysis reveals that not only politically influenced firms, such as China's state-owned enterprises adjusted their trading behavior, but, rather, privately owned firms also became more precautionary and intentionally diversified their trading portfolios.

The rest of this paper proceeds as follows. In section 2, we provide some background on China's 2010 decision to impose sanctions on the imports of Norwegian fresh salmon, as well as China's fresh salmon trade in general from 2007 to 2015. Section 3 provides details on the firm-level Chinese Customs data we use in this study. Section 4 presents the event study approach that we employ to causally identify firm-level responses to the 2010 fresh salmon sanction at both the intensive and extensive margins. Section 5 provides results on firm-level responses at the extensive and intensive margin. Finally, we discussed how our results differ from and improve previous findings and explore the possible mechanisms using a partial-equilibrium model of firm importing decisions in section 6. Section 7 concludes.

2 BACKGROUND ON CHINA'S 2010 SANCTION ON NORWEGIAN FRESH SALMON

A six-year political dispute between China and Norway began with the nomination and awarding of the 2010 Nobel Peace Prize (Figure 1). In January, it was leaked that Mr. Liu Xiaobo, a famous imprisoned Chinese political dissident, was nominated for the Nobel Peace Prize. Chinese Ministry of Foreign Affairs (MFA) spokesman Ma Xiaoxu quickly responded in February 2010 that awarding Liu would be a "grave mistake". Similarly, in a visit to Norway in June 2010, China's Vice Foreign Minister Fu Ying, warned Norway's government that awarding the Nobel Peace Prize to Liu would be viewed as "an unfriendly move towards Beijing" and could deteriorate relations between Oslo and Beijing (Moskwa, 2010). On September 28, 2010, MFA spokesman Jiang Yu explicitly warned that awarding Liu would "send a wrong message" because Liu is imprisoned for breaking China's laws. However, Norway's Nobel Committee still awarded the Nobel Peace Prize to Mr. Liu in October 2010, which immediately angered China's government. Within days, China summoned Norway's ambassador and declared the decision a "blasphemy" and insult to Chinese people (Reuters, 2010), and then cancelled the meeting with Norway's fisheries minister (Guardian, 2010).

The political tensions quickly spread to the arena of commerce and trade. As Chen and Garcia (2016) documents, on December 8, 2010, the Beijing Capital Airport Entry–Exit Inspection and Quarantine Bureau issued a regional order that required stricter and more thorough inspection of Norwegian fresh aquaculture products. The Central Office of Quality Supervision, Inspection and Quarantine of China issued document No. 9, on January 28, 2011, which called for more stringent sanitation and veterinary testing of imports of chilled farmed salmon. The majority of stakeholders interviewed by Chen and Garcia (2016) claim that shipments of Norwegian salmon were always checked and that testing and inspection took longer—at the time, it could take up to 20 days for Norwegian salmon to clear customs. Salmon from other producing countries were only randomly checked; and when checked, complete sanitation tests and veterinary inspections only took three to four days. Norway's salmon exports to China quickly reflected the effects of these measures, shrinking 60% in a year that China's salmon market quickly grew (Godfrey,

2012).

The China-Norway bilateral relationship was not normalized again until 2016, though it did go through some ups and downs from 2012 to 2016. In February 2012, Norway supported China having an observer role as a Non-Arctic State in the Arctic Council (BBC, 2012), to which China responded positively by calling for further "concrete measures" from Norway to improve the bilateral relations. Despite these thawing signs, in December 2012, China offered visa-free visits to Beijing for visitors from many European countries other than Norway (Anderlini and MacCarthy, 2012). Norway made other friendly gestures toward China starting in 2013 when a new government was elected and Borge Brende, who reportedly had a direct contact with China's prime minister, was made Norway's foreign minister. In May 2014, Norway's government declined to meet the Dalai Lama (Gladstone, 2014), which received praise from China. However, in 2015, Norway's national security and intelligence departments accused China of massive cyberattacks and illegal intelligence collection, rated China as a "threat" alongside Russia, and also expelled a Chinese graduate student due to national security concerns (Reuters, 2015). All these actions led to slowly improving, yet stagnant, bilateral political relations.

In September 2014 and March 2015, China banned the imports of whole salmon from certain regions of Norway over concerns of infectious salmon anaemia (Wright, 2015). In April 2015, almost one year after Norway's decision to not meet with the Dalai Lama, China agreed to accept new proof that Norwegian salmon met international health and safety standards and thus exports from Norway's three affected counties could resume using a new health certificate for fish products (Berglund, 2015). It was not until December 2016 when Norway and China finally resumed and normalized diplomatic and political ties following a surprise visit by Norway's foreign minister Brende (Jacobsen and Blanchard, 2016). In April 2017, Norway's Prime Minister visited China for the first time since 2010 and resumed the bilateral trade talks on a free trade agreement. One month later, China formally agreed to reopen to Norwegian salmon exports, more than six years after bilateral relations froze (Jing, 2017; Sina, 2017).

3 DATA

We use China's customs data from China Customs Bureau. Data include individual firm's trade records and information on imports and exports for each firm, recorded according to the eight-digit classification (a refined version of the Harmonized Commodity Description and Coding System (HS) six-digit classification). We define that value for every product that China imports from other countries as the value of imports China reports arriving from other countries. We present all price and value data in nominal Chinese yuan, and we present quantity data in metric tonnes, megawatt-hours, or discrete units (e.g., widgets, vehicles, etc.), as noted. Unless otherwise noted, we source data in the text and figures from China Customs Bureau. Data also contain information about import arrival port, shipment, mode of transport, routing countries, as well as firm characteristics such as firm type, and location. Our analysis includes approximately 99% of all transactions.

The main dataset contains 74,221 transactions from 6,101 firms at the eight-digit classification level of seafood imports from 2007 to 2015. We start with 220 firms that imported fresh salmon during the study period. From this set, we create two mutually exclusive subsets—firms that imported Norwegian fresh salmon before 2010, and firms that did not import Norwegian fresh salmon before 2010 but did import fresh salmon during the study period.

We first focus on the impact of the salmon sanctions on the 49 firms that imported Norwegian fresh salmon before 2010 (see Table 1 panel A for summary statistics). During the 2007–2010 period, 22 firms only imported fresh salmon in one year, 14 firms imported fresh salmon in two of the years, and 13 firms imported fresh salmon at least in three of the years. Before 2010, each firm had, on average, 4.7 seafood trading routes, 1.41 import source countries and a 98% maximum import share for any source country. However, after the salmon sanction, firms' average number of importing source countries rose to 2.67 and the maximum import share of any one country dropped to 82%. These 49 firms differ from one another in ways that are potentially relevant to other seafood import outcomes. The average seafood share of all imports among these firms is about 61%, while there are about 19 firms in our study with a seafood share below 50% of all imports. Moreover, 47% of

firms import higher than the average market level and 55% of the firms also import fresh salmon from other countries.

We next look at the rest of the fresh salmon importing firms. Of these firms, 17 firms imported fresh salmon from countries other than Norway before 2010 and 158 firms imported fresh salmon from 2010 to 2015. As shown in Table 1 panel B, on average, 69% of firms' imports came from seafood, and each firm had 8.47 seafood trading routes before 2010. The salmon sanction increased the average number of import source countries (from 1.06 to 1.64) and slightly decreased the average maximum import share (from 97% to 91%).

To identify the causal effects of the salmon sanction accurately, we examine a counterfactual situation in which firms in the seafood industry were unaffected by China's sanction of Norwegian fresh salmon. We start with non-fresh seafood firms that did not import any seafood products from Norway before 2010. Figure A1 presents the 2007–2010 import trends of countries that were and were not affected by the salmon sanction across different seafood products. We restrict our sample to the top seven frozen- or aquatic-product importing source countries and look for those that have import trends similar to Norwegian fresh salmon in the years preceding the 2010 salmon sanctions.

As shown in figure A1c, most of the frozen-product importing source countries have a relatively flat importing trend from 2007 to 2010, while Russia experienced a dramatic increase in frozen product imports and shows a trend similar trend to Norwegian fresh salmon imports. As opposed to frozen product imports, aquatic product imports share a similar trend across the top-seven aquatic-product importing source countries (figure A1d). Considering that recent boycotts between China and neighboring Asian countries might affect aquatic product imports, we restrict our sample to North American aquatic products for our control groups.

We then compare how treated firms and the sub-sample control groups differ across firm characteristics. In Appendix Table A1, we test for the differential changes before the salmon sanction. Columns 1–5 show the mean of firm variables in treated firms—North American shrimp, North American crab, North American other aquatics, and Russian frozen herring.

We find significant differences exist between treated firms and Russian frozen herring. Within North American aquatic products, we find restricting the control sample to North American shrimp helps reduce the magnitude of these differences. Therefore, we keep the 527 firms importing North American aquatic shrimp as our control group. In section 5, we use other types of firms within our sub-sample to check the robustness of the estimated coefficients.

Across these 527 firms, 166 firms were in the North American shrimp market before China's sanction. By 2015, the number of firms in the North American shrimp market increased to 442. As opposed to firms importing Norwegian fresh salmon, these North American shrimp firms have large average seafood share (73%) and more seafood trading routes (5.43). The salmon sanction did not significantly impact the number of import source countries (from 1.06 to 1.19) as well as the maximum import share (from 96% to 90%). More detailed information about these categories is available in Table 1.

4 EMPIRICAL STRATEGY

4.1 *Intensive-margin impacts on Norwegian fresh salmon imports*

In our main empirical analysis, we first study the direct, or intensive-margin, impact of China's salmon sanction on Norwegian fresh salmon imports for the treated firms, which we define as firms importing Norwegian fresh salmon before the 2010 sanction. Between 2007 and 2015, China's fresh salmon importers made 347 import transactions of fresh salmon from Norway. For the treated firms, we explore three measures of Norwegian fresh-salmon import decisions for China's firms: (a) the value of firm-level imports of Norwegian fresh salmon; (b) the quantity of firm-level imports of Norwegian fresh salmon; and, (c) the number of firm-level importing trips involving Norwegian fresh salmon. For the first two outcomes, we use firms that imported North American fresh shrimp as the main control group and estimate the following event-study specification:

$$y_{ijt} = \sum_{\tau \in [-3, 5], \tau \neq 0} \alpha_{\tau} [D_{ijt, \tau} \times \text{NFS}_i] + \gamma_i + \sigma_{pt} + \epsilon_{ijt} \quad (1)$$

where i indexes China's import firm; t indexes the year; y_{ijt} is a log of import value or import quantity for import good j for a particular importing trip by firm i in year t ; and,

NFS_i is an indicator equal to 1 if firm i imports Norwegian fresh salmon. For $\tau > 0$, $D_{ijt,\tau}$ equals 1 if it is the τ th year after China's salmon sanction. For $\tau < 0$, $D_{ijt,\tau}$ equals 1 if it is the $-\tau$ th year before the salmon sanction. We include the firm fixed effect γ_i to absorb time-invariant differences and allow consistent estimation even in the presence of differences between treated and untreated firms. We further include the port-by-year fixed effects σ_{pt} to control for unobserved common shocks. In our setting, $D_{it,\tau}$ is highly serially correlated and the default standard errors are likely to be downwards-biased (Arellano et al., 1987; Bertrand et al., 2004; Cameron and Miller, 2015). To address this issue, we use cluster-robust standard errors, which allows us to assume errors in different years for a given firm are correlated but errors for different individuals are uncorrelated.

Our main coefficient of interests, α_τ , represent the average annual percentage changes in Norwegian fresh salmon imports τ years following China's decision to impose sanctions relative to the event year 0, conditional on all the covariates and fixed effects included in the regression. These coefficients provide two important pieces of information. First, they provide a check of Granger causality between the salmon sanction and Norwegian fresh salmon imports. If the pre-period coefficients are statistically indistinguishable from zero and have no clear trend, this would provide some reassurance for the identification assumption. Second, the specification allows us to investigate the dynamic impact of the salmon sanction over the study period.

The main concern for identification is whether the parallel trends assumption is valid in our event-study design. In the absence of treatment, treated units should experience the same trends in average outcomes as the control units. In our context, we want North American fresh shrimp form a credible counterfactual for the treated firms (Blundell and Dias, 2009) after accounting for time-invariant (observed and unobserved) differences between firms and common port-by-year shocks. To check the validity of the identification assumption, we provide suggestive evidence of no differential pre-trends in import value of Norwegian fresh salmon relative to the import value of North American shrimp before 2010.

Another concern is whether the difference-in-differences estimates are biased due to a

sample selection problem. If the firm exit decisions are driven by factors that are systematically related to the response variable, even after we condition on explanatory variables, the estimated coefficients would be biased due to a sample selection problem (Semykina and Wooldridge, 2010; Verbeek and Nijman, 1992; Wooldridge, 1995). As shown in Figures 2 and A2, we not only observe a significant number of firms dropped out from the Norwegian fresh salmon market after the Norway-China sanction, but also find the treated firms with high seafood import share or a large number of trading countries are more likely to stay on the market. To determine whether there is evidence of selection bias due to the sanction, we define $Remain_{i,t}$ as an indicator that equals to 1 if firm i in year t remains on the market. We then add (one at a time) $Remain_{i,t-1}$ and $Remain_{i,t+1}$ as explanatory variables in the regression to determine whether there is evidence of selection bias. To preview the results, we find suggestive evidence of selection bias in our specification.

To correct the potential selection bias, we follow procedure 5.2.1 in Semykina and Wooldridge (2010). In the first stage, we run a probit regression for each time period:

$$Remain_{i,t} = \eta_1 seafood_{i,t} + \eta_2 num_{i,t} + \eta_3 \overline{seafood}_i + \eta_4 \overline{num}_i + v_{i,t} \quad (2)$$

where $seafood_{i,t}$ is seafood's share of total imports and $num_{i,t}$ is the number of seafood trading countries for firm i in year t . In our data, seafood import share and number of seafood trading countries are not available for each year, thus we construct two variables by replacing the missing value with zero, as these firm did not import any seafood in the given years. We also include the average seafood import share $\overline{seafood}_i$ and number of trading countries for each firm \overline{num}_i to serve as fixed effects for each firm. Once the coefficients are estimated, we calculate the inverse Mills ratio, $\hat{\lambda}_{i,t} = \lambda(\hat{\eta}_1 vsh_{i,t} + \hat{\eta}_2 num_{i,t} + \hat{\eta}_3 \overline{seafood}_i + \hat{\eta}_4 \overline{num}_i)$ ¹.

In the second stage, we estimate the event-study coefficients by adding $\hat{\lambda}_{i,t}$ as follows:

$$y_{ijt} = \sum_{\tau \in [-3,5], \tau \neq 0} \alpha_{\tau} [D_{ijt,\tau} \times NFS_i] + \sum_{t \in [-3,5]} \beta_t \hat{\lambda}_{i,t} + \gamma_i + \sigma_{pt} + \epsilon_{ijt} \quad (3)$$

¹ λ denotes the inverse Mills ratio.

where $\hat{\lambda}_{i,t}$ is the inverse Mills ratio for firm i in year t and other variables are defined the same as for equation (1). To estimate the asymptotic variance, we re-sample the firms and use the bootstrap sample to approximate the distribution of the parameter vector.

Lastly, one might worry that, instead of decreasing the import amount for each trip, firms might reduce the number of importing trips as a response to this sanction. To examine how the salmon sanction affected the number of importing trips denoted above, we collapse our final data into the firm-year level and sum the number of trips for each firm and year over the study period. We then estimate the event-study specification with corrected selection bias as follows:

$$Trips_{it} = \sum_{\tau \in [-3,5], \tau \neq 0} \alpha_{\tau} [D_{it,\tau} \times NFS_i] + \sum_{t \in [-3,5]} \beta_t \hat{\lambda}_{i,t} + \gamma_i + \eta_t + \epsilon_{it} \quad (4)$$

where i indexes China's import firm; t indexes the year; and, $Trips_{it}$ is the number of importing trips across all ports for firm i in year t . Since we aggregate the import data across all ports, we only include year fixed effects η_t and firm fixed effects γ_i to control for all the time-variant determinants and time-invariant determinants specific to firm i . The estimated robust standard errors are clustered at firm level and the error term ϵ_{it} includes other determinants of import outcomes. All other variables are defined the same as for equation (3).

4.2 Extensive-margin impacts

To study firms' responses along the intensive margin, we investigate the extensive-margin impacts of the salmon sanction. We ask whether firms would reshape their trading strategies in terms of four measures: (a) other seafood import outcomes, such as other seafood product imports, fresh salmon total imports, and fresh seafood total imports; (b) the number of countries importing fresh salmon; (c) the fresh salmon import share of the main source countries (Norway, Faroe Islands, United Kingdom, and Chile); and, (d) the maximum import share for any source country.

We first examine the potential trade diversion effects on other seafood products as well as the sanction's impact on total fresh salmon and fresh seafood imports. The restriction

on Norwegian fresh salmon imports could lead to increased imports of other Norwegian fresh fish species and Norwegian non-fresh salmon imports for treated firms. We examine the changes in other seafood product imports of treated firms by estimating the following event-study specification:

$$y_{ijt}^{Oth} = \sum_{\tau \in [-3,5], \tau \neq 0} \alpha_{\tau} [D_{ijt,\tau} \times NFS_i] + \sum_{t \in [-3,5]} \beta_t \hat{\lambda}_{i,t} + \gamma_i + \sigma_{pt} + \epsilon_{ijt} \quad (5)$$

where i index China's import firm; t indexes the year; Oth indexes other seafood product imports for treated firms (other Norwegian fresh fish species and Norwegian non-fresh salmon); and, y_{ijt}^{Oth} is a log of import value for import good j per trip for firm i in year t . We cluster the estimated standard errors at firm level and all other variables are defined the same as in equation (3).

We then examine how China's salmon sanction reshaped firms' import decisions for fresh salmon or fresh seafood. We use total fresh salmon and total seafood import values as measures and estimate the event-study specification as follows:

$$Total_{it} = \sum_{\tau \in [-3,5], \tau \neq 0} \alpha_{\tau} [D_{it,\tau} \times NFS_i] + \sum_{t \in [-3,5]} \beta_t \hat{\lambda}_{i,t} + \gamma_i + \eta_t + \epsilon_{it} \quad (6)$$

where i indexes China's import firm; t indexes the year; $fish$ indexes total fresh product imports for treated firms (fresh salmon and fresh seafood); and, $Total_{it}$ is the total fresh product imports for firm i in year t . The estimated robust standard errors are clustered at the firm level and all other variables are defined the same as in equation (4).

Next, we investigate the impact of China's salmon sanction on the number of countries importing fresh salmon after 2010. We calculate the number of importing source countries by summing the number of countries that a firm imported fresh salmon from by firm and year. We then use treated firms as a treatment group and North American shrimp firms as the control group and estimate the event-study specification as follows:

$$Countries_{it} = \sum_{\tau \in [-3,5], \tau \neq 0} \alpha_{\tau} [D_{it,\tau} \times NFS_i] + \sum_{t \in [-3,5]} \beta_t \hat{\lambda}_{i,t} + \gamma_i + \eta_t + \epsilon_{it} \quad (7)$$

where i indexes China's importing firm; t indexes the year; and, $Countries_{it}$ is the number of importing source countries for firm i in year t . The estimate robust standard errors are clustered at firm level and all other variables are defined the same as in equation (4).

A closer examination of the import share of fresh salmon for each source country provides some insight on how firms change their importing sources over the study period. We focus on the main fresh salmon importing source countries (Norway, Faroe Islands, United Kingdom, and Chile) and calculate the import shares by firm and year. We then examine the change of import share for each country by estimating the event-study specification as follows:

$$Share_{it}^c = \sum_{\tau \in [-3,5], \tau \neq 0} \alpha_{\tau} [D_{it,\tau} \times NFS_i] + \sum_{t \in [-3,5]} \beta_t \hat{\lambda}_{i,t} + \gamma_i + \eta_t + \epsilon_{it} \quad (8)$$

where i indexes China's import firm; t indexes the year; c indexes the main importing source countries (Norway, Faroe Islands, United Kingdom, and Chile); and, $Share_{it}^c$ is the import share for firm i in year t from country c . For instance, $Share_{it}^{Norway}$ represents Norway's import share for firm i in year t . We cluster the estimated robust standard errors at firm level and all other variables are defined the same as for equation (4).

Lastly, to understand how importers change their trading strategies in the long run, we explore the changes of the maximum import share for any source country due to the salmon sanction. We define $Share_{it}^{c,max}$ as the maximum import share for any source country for firm i in year t and use the same regression in equation (4) to estimate the sanction impacts:

$$Share_{it}^{c,max} = \sum_{\tau \in [-3,5], \tau \neq 0} \alpha_{\tau} [D_{it,\tau} \times NFS_i] + \sum_{t \in [-3,5]} \beta_t \hat{\lambda}_{i,t} + \gamma_i + \eta_t + \epsilon_{it} \quad (9)$$

where i indexes China's import firm and t indexes year. We cluster the estimated standard errors at firm level and all other variables are defined the same as in equation (4).

5 RESULTS

We first present the intensive-margin results by examining the changes in Norwegian fresh salmon import value relative to North American shrimp import value. We then estimate the extensive-margin impact by testing how the number of importing source countries, import shares of individual main source countries, and maximum import share differ among treated firms relative to our control groups. Lastly, we explore how the heterogeneous impact of the salmon sanction differed according to firm size, firm ownership structure, and previous trading history.

5.1 *Intensive-margin impacts on Norwegian fresh salmon imports*

Figure 2 shows some suggestive evidence of how treated firms responded to the sanction. As shown in Figure 2a, between 2007 and 2010, Norwegian fresh salmon imports grew at an average annual rate of 32%, from 28 million Chinese yuan in 2007 to 86 million Chinese yuan in 2010; over the same period, little-to-no fresh salmon imports from other countries suggests that Norway dominated the fresh salmon market before 2010. After Norway's Nobel committee awarded Liu Xiaobo the Nobel Peace Prize in October 2010, China IQB called for more stringent sanitation and veterinary testing of imports of chilled farmed salmon, leading to a dramatic drop in Norway imports in 2011. However, the Norwegian fresh salmon imports readjusted to 2010 levels in 2012. One explanation for this is the price of Norwegian fresh salmon decreasing in 2012, leading to an increase in Norwegian fresh salmon imports even with stricter inspections. Inconsistent with this hypothesis, Figure A4 in the appendix shows that the Norwegian fresh salmon price in 2012 was actually comparable to 2011 levels and the main fresh salmon importing source countries also experienced a drop in fresh salmon price. This suggests that a drop in price might not explain the import increase in 2012.

Another possible reason could be the early 2012 gesture made by Norway's government to support China's application to become a permanent observer of the Arctic Council provided a positive signal for China's fresh salmon importers. Anticipating trade relations would unfreeze, China's firms increased their salmon import share from Norway in 2012. However, when China offered visa-free visits to Beijing for Europeans from every country except Norway in December 2012, China's firms decreased fresh salmon imports from Norway and increased fresh salmon imports from other countries, such as Faroe Islands, United Kingdom, and Chile.

China's firms may also have shifted from importing fresh salmon to importing frozen salmon, as the sanction only affected fresh salmon products from Norway. Figure 2b shows the change in China's frozen salmon import value by country from 2007 and 2015. We find no evidence of a spillover effect on Norwegian frozen salmon imports after 2010. Frozen

salmon imports from other countries did not respond to the sanction, except for Chile, whose imports increased from 10 million Chinese yuan in 2012 to 70 million Chinese yuan in 2014. We provide suggestive evidence that Chile's increase in frozen salmon imports is highly associated with Chile's efforts to control salmon diseases from 2007 to 2010.

We also test whether and how the number of firms changed due to the 2010 salmon sanction to provide descriptive evidence of sample selection issues. Figure 2c presents the number of firms importing Norwegian fresh salmon and the fresh salmon import changes from 2007 to 2015. To do this, we define treated firms as those firms importing Norwegian fresh salmon before 2010. We define other firms as those that only imported Norwegian fresh salmon after China's sanction. As China issued stricter sanitation tests and veterinary inspections, we find a significant number of treated firms dropped from the market entirely with no imports of fresh salmon from any country. This could lead to selection bias when certain types of importing firms systematically exited from the market. We also find that an increasing number of other firms entered the fresh salmon market and gained a foothold due to the salmon sanction. In Figure 2d, we find a significant decrease in the maximum import share across treated firms. The maximum share decreased to 80% one year after the salmon sanction, readjusted to 90% in the second year, and then continued decreasing over the rest of the period.

We then implement event-study specification shown in equation (1) to estimate the intensive-margin impact of the 2010 sanction on Norwegian fresh salmon import value and quantity for treated firms (see Figure 3). In the years before the salmon sanction, the coefficients are all statistically indistinguishable from zero, have modest magnitude, and have no clear trend. Following the salmon sanction, the import value fell sharply and the average import decreased by 86% ($=e^{-2.1}-1$) in value in the first year, relative to the import value of North American shrimp. In contrast with previous studies that find political tensions only have temporary effects on trade (Crozet and Hinz, 2020; Fuchs and Klann, 2013; Heilmann, 2016; Michaels and Zhi, 2010; Pandya and Venkatesan, 2016), the magnitude and long-run nature of sanction effects are noteworthy. These effects fluctuate and persist over the next few years to an almost -99% reduction in Norwegian fresh salmon import value by the

end of 2015. The results are similar in the case of import quantity. Figure 3c shows no evidence of a differential trend in import quantity before the sanction. In the first year after the sanction, the import quantity decreased by 90%; and, five years later, the quantity decreased by 99%. Table 2 provides additional details.

To formally test for the potential selection bias, we use equation (3) and present results in Appendix Table B1. When we add the selection indicator in previous years to the regression, the coefficient on $s_{i,t-1}$ is 0.66 with a robust t statistic of 4.48. When we use $s_{i,t+1}$, we get a coefficient of 0.399 with $t = 3.2$. These results suggest that import value in year t is higher for those in the market in the previous year $t - 1$, and the decision whether stay in the market the next year $t + 1$ is positively correlated with the salmon sanction. In any case, we need to correct the selection bias to get an unbiased difference-in-differences estimate.

Figures 3b and 3d present the results of our bias-corrected difference-in-differences estimates. Changes in value of Norwegian fresh salmon imports are slightly smaller or larger in magnitude and show a persistent downward trend over our study period relative to the value of North American shrimp imports. The estimated coefficients in the last year of our study period, roughly -96%, is slightly smaller in magnitude than for the difference-in-differences estimates we find earlier without accounting for sample selection. Table 3 provides additional details. Since the selection correction approach removes potential bias from sample selection issues, the estimate change better captures the causal impact of the salmon sanction. For the rest of this section, we present the corrected difference-in-differences estimates for both the intensive and extensive margins.

Lastly, we examine how the number of importing trips changed because of the sanction and present results in Figures 3e and 3f. We find evidence of insignificant negative impacts of the salmon sanction on the number of trips over our study period. The no differential pre-trend in the preceding years suggests that the number of transactions before the salmon sanction are similar between Norwegian fresh salmon imports and North American shrimp imports. After 2010, we observe evidence of decreases in the number of transactions; however, the estimated coefficients are insignificantly distinguishable from zero, which

suggests that treated firms were more likely to decrease their imports for each transactions rather than decreasing the number of importing trips in response to the salmon sanction.

5.2 *Extensive-margin impacts*

We first examine the potential trade diversion effect as well as the effect on a firm's total fresh salmon imports. We ask whether China's sanction on Norwegian fresh salmon would increase the imports of other Norwegian fresh fish species or other Norwegian non-fresh salmon across the treated firms. Figure 4 presents our results. Different from the findings in Crozet and Hinz (2020) and Ahn and Ludema (2020) that suggest evidence of sanction spillovers on non-sanctioned goods, we find little-to-no evidence of differential trends in imports before the 2010 sanction. We then study how the salmon sanction impacted fresh salmon imports and fresh seafood imports for fresh-salmon importing firms. As shown in Figure 4c, despite the treated firms starting to import fresh salmon from countries other than Norway, we find a large and persistent decrease in the total fresh salmon import for treated firms, such that, five years later, total imports decreased by 86% relative to North American shrimp imports. We find some evidence of large decreases in total fresh seafood imports for treated firms—63% in the first year to 91% in the fifth year, relative to North American shrimp imports (see Figure 4d). We also examine how other fresh-salmon importing firms responded to this event. We find little-to-no evidence of increases in the total fresh salmon imports or total seafood imports (see Figures 4e and 4f).

Figure 5a presents the effect of the salmon sanction on the number of fresh salmon importing source countries. The dashed lines show the 95% confidence intervals. Reassuringly, we do not find a differential number of importing source countries in the years preceding the sanction. Similar with previous study (Haidar, 2017) that suggest sanction would divert trade to non-sanctioning countries, following the sanction, firms exhibit large increases in the number of countries they import from. In the first year after the sanction, the number of fresh salmon importing source countries increased by one versus those of shrimp, relative to the years before sanction. The sanction shows a persistent effect on the number of fresh salmon importing source countries, such that the average number is one larger relative to years before the sanction over the rest of the period. This on average represents a doubling

in trading partners from 1.4 before the sanction, predominantly Norway, to 2.7 following the sanction.

We also find a heterogeneous response to the sanction in terms of the number of fresh salmon importing source countries across firms with different trading histories. When we restrict the sample to firms that imported Norwegian fresh salmon alone before 2010 (see Figure 5b), it took two years for these firms to significantly increase the number of importing source countries, while firms that imported fresh salmon from other countries before 2010 quickly responded to the sanction by importing from another 1.5 countries in the first year after the event (see Figure 5c). One potential reason for this is firms that do not have trading history with other countries need more time to search for alternative importing sources.

We then examine how the importing source country shares changed due to the salmon sanction (see Figure 6 for results). We find some evidence of both negative short-run and long-run relationships between the sanction and China's imports of Norwegian fresh salmon. Figure 6a suggests that Norway experienced a 30% drop in China's import share in the first year after sanction. The import share readjusted to pre-sanction levels in the second year due to a positive signal from Norway's government; however, import share then continued decreasing over the rest of the period. The decreasing Norway import share suggests that China's importers decided to change their trading strategies and shift their main import source to other countries. Conversely, we find that Faroe Islands is the biggest winner of the salmon sanction (see Figure 6d). In the first year after the sanction, Faroe Islands' share of China's fresh salmon imports increased 10%, and then increased 20% over the rest of the period. The relationship between sanction and import share of other countries is also evident (see Figure 6c). We find the United Kingdom experienced a 20% increase in China's fresh salmon import share in the first year. In the second year, the United Kingdom's share dropped, then gradually increased later. Five years later, the United Kingdom's share of Chinese imports had increased by around 20%. Lastly, we find little-to-no evidence that the sanction increased the import share of fresh salmon from Chile in the first three years (see Figure 6b). The share of imports from Chile increased to

30% five years after the sanction, which is likely due to the progress in upgrade talks on Chile-China Free Trade Agreement with China started in 2015 and 2016.

Finally, we examine how firms changed their long-term importing strategies after the 2010 salmon sanction. We test the maximum importing share changes due to the sanction across treated firms and present the results in Figure 7. The economic sanction uncertainty might have an impact on firms' decisions and lead to more diversified their trading portfolios. Consistent with this hypothesis, we observe a dramatic drop one year after the sanction and a gradual decrease over the longer period. A closer examination of firms that only import fresh salmon from Norway suggests that firms that only imported Norwegian fresh salmon before 2010 started to switch their importing source country away from Norway three years after China's salmon sanction, consistent with transition difficulty due to having no other import sources before the sanction (see Figure 7b). The gradual increase in the maximum import share in the last two years might suggest these firms completely transitioned away from Norway as a source country. In contrast, in Figure 7c, we observe that firms that had other trading routes before 2010 quickly responded to the sanction and decreased their maximum share by 20%. Starting from the third year, these firms readjusted their import strategies and decreased their import share from Norway to reduce the potential risks.

5.3 *Heterogeneous impact of China's 2010 salmon sanction*

We present evidence on the ways in which treated firms adjusted in response to the sanction. We test how sanction impacts differ according to firm size, seafood share of total imports, the trading routes, and firm type.

We use a generalized triple-difference design to examine heterogeneous responses to the salmon sanction across different firm characteristics. To use all firms in our dataset, we construct a balanced panel by assigning a negligible amount of import value for the years when a firm did not import.² For ease of interpretation, we implement these tests by interacting the first term in equation (3) with indicators for firm characteristics. Our main

²This mechanically mean assigning the log import value of fresh salmon and North American shrimp equals 0.01 if a firm did not import these products in a particular year to avoid the log of zero.

specification is:

$$y_{ijt} = \sum_{\tau \in [-3,5], \tau \neq 0} \alpha_{\tau} [D_{ijt,\tau} \times \text{NFS}_i] + \sum_{\tau \in [-3,5], \tau \neq 0} \eta_{\tau} [D_{ijt,\tau} \times \text{NFS}_i \times Z_j] \quad (10)$$

$$+ \sum_{t \in [-3,5]} \beta_t \hat{\lambda}_{i,t} + \gamma_i + \sigma_{pt} + \epsilon_{ijt}$$

where Z_j is an indicator function that equals 1 if firm j belongs to a specific group: the import value of firm j is above the average industry value, or the firm imported salmon only from Norway, or it is a state-owned enterprise. All other variables are defined the same as in equation (3).

One hypothesis is that the sanction would have larger impacts on firms with larger seafood import share. Firms with higher seafood import ratios are more likely to have seafood trading routes with countries other than Norway, hence they could respond to the sanction faster and import fresh salmon from other countries. We split firms depending on whether their seafood import share is above 50%. Table 4 column 2 present our results. We find that, in the first two years, firms with higher seafood share decreased Norwegian fresh salmon imports by 73% more relative to firms with low seafood share. The effect continued expanding—five years later, firms with a higher seafood share imported 83% less fresh salmon.

We then test whether the salmon sanction had a larger impact on relatively larger firms or relatively smaller firms. One might think that firms with larger import volume could bear the switching costs and import fresh salmon from other countries, and therefore, the sanction would be associated with a larger decrease in import value for large firms relative to small firms. Consistent with this hypothesis, Table 4 column 1 confirms that these firms are more likely to decrease their imports of Norwegian fresh salmon after 2010. Z_j is defined in equation (10) as an indicator equals 1 if the import value of firm j is above the average industry value. We find evidence that firms importing higher than average volumes decreased their Norwegian fresh salmon imports by 63% more relative to firms with lower import volumes in the first year and by 86% more five years after the sanction.

Next, since we find evidence of late reaction to the salmon sanction among firms that

imported fresh salmon only from Norway prior to 2010, a natural question is whether these firms would decrease their Norwegian fresh salmon import volumes less relative to firms that had trading routes with other countries. The results shown Table 4 column 3 bear this out. We find evidence of relatively large decreases in Norwegian fresh salmon imports for firms that imported fresh salmon only from Norway before 2010, which can be explained by the fact that firms importing fresh salmon from multiple countries could more easily switch to sources other than Norway.

Finally, we test whether state-owned firms are more likely to adjust their trading behavior relative to privately owned firms. In contrast with previous literature (Du et al., 2017; Lin et al., 2019), we find evidence of little-to-no differential response to China’s salmon sanction across state-owned and private-owned firms (see Table 4 column 4). This result suggests that not only politically influenced firms, such as China’s state-owned enterprises adjusted their trading behavior, but, rather, privately owned firms also became more precautionary and intentionally diversified their trading portfolios. Taken together, we conclude that the sanction had dramatic impacts on firms with large import values, higher seafood import share, and more fresh salmon trading routes but no differential impact across different firm types. Notably, we find that significant importing responses for both private and state-owned enterprises, which is in contrast with the previous findings of only responses from politically influenced firms such as state-owned enterprises.

6 DISCUSSIONS AND A PARTIAL-EQUILIBRIUM EXPLANATION

6.1 *Threats to identification and robustness checks*

We test the robustness of our event-study results presented in section 5. We first discuss whether the treatment effect varies across different timing, and we then run placebo tests to examine any potential unobserved shocks in 2010. Lastly, we test whether the estimated coefficients would be biased if we used alternative control groups.

First, recent papers by Roth (2018) and Goodman-Bacon (2018) discuss the potential biases of estimating the average treatment effects when the effects change over time. In our case, there are two orders issued by China IQB (December 2010 and January 2011) calling

for more stringent sanitation and veterinary testing of Norwegian fresh salmon imports. However, given that importing firms knew about the nomination in January 2010, and both IQB actions happened around the end of 2010, the chances that the treatment effect would vary much are pretty small; therefore, we treat these two events as one policy treatment to examine its impact on Norwegian fresh salmon imports.

Second, another potential threat to the internal validity of the study is that there might be other shocks that both affect the seafood imports and occur concurrently with, or just after, China's salmon sanction began. To investigate this, we estimate regressions similar to equation (3) but replace the dependent variable with other seafood product import values from unaffected firms that have never imported any type of salmon before 2010. If there are any shocks that affect the seafood imports, then we would expect some evidence of import changes after 2010. Figure B1 presents the event-study results for other seafood imports from unaffected firms. Overall, we find little-to-no evidence that the salmon sanction had any impact on other seafood imports from unaffected firms. These results suggests there were no other factors influencing the seafood import values at the time of the salmon sanction.

In addition, to explore the sensitivity of our results, we construct several alternative control groups by exploiting different firm configurations among seafood importers, including firms that import Asian fresh shrimp, North American crab, and Russian frozen herring. We also use different seafood imports within the treated firms as controls to examine the robustness of our results. First, we examine whether firms importing other seafood products from other countries experienced different unobserved shocks that might affect their importing outcomes. We provide evidence to alleviate this concern in Figure B2. As Figure B2a shows, using Asian shrimp as a control does not lead to appreciable changes in the estimated coefficients—except for 2013 when differential imports readjusted back to almost zero. The readjustment might be partially explained by the boycotts between China and other Asian countries over our study period. We also use firms importing Asian and North American shrimp as controls (see Figure B2b). The estimated coefficients show similar trend to estimated coefficients using North American shrimp. We use other

seafood products such as North American crab and Russian frozen herring as controls—the estimated coefficients are similar to those in our baseline results. Lastly, we use other fish products imported by treated firms as controls to test if our estimates are explained by the contrast to other seafood firms or by other seafood products within the same firms. We find similar estimates across different samples (see Figure B3).

We also test for the sensitivity of our results by using an alternative definition of treated firms and control firms. In particular, we define the alternative treated firms as firms importing fresh salmon from any country before 2010 and define the alternative control group as firms importing North American shrimp before 2010 to see how the estimated coefficients change. We find similar estimates using the alternative control group, while the coefficients are slightly larger using the alternative treatment group (see Figure B4). Overall, these alternate specifications corroborate the suitability of our event-study specification to estimate the effects of interest.

6.2 *Import diversification and emerging explanation*

We develop a partial-equilibrium model of firms' importing behavior to rationalize our empirical findings. As suggested in Haveman and Hummels (2004), countries tend to import from few exporters—58% of importers purchase from around 10% of available exporters. We do find that China's salmon importers decreased their purchases from Norway and expanded their sourcing countries under the long-term bilateral political tension. China's importers chose to take an import diversification strategy when facing political risks. As Wolak and Kolstad (1991) and Muhammad (2012) argue, one reason that firms do diversify imports is to control price uncertainty of the sourcing countries. In the spirit of Antras et al. (2017)—firms pay a fixed cost to improve their efficiency—we build a simplified model to understand firms' behavior under political tensions. Firms can add a new import country by paying a one-time fixed cost, which can potentially improve their efficiency of production by importing from multiple sources. Thus, firms face trading higher efficiency for a higher fixed cost of importing.

In our simplified model, firms face a declining demand curve for salmon and salmon

from Norway and other countries are perfect substitutes. Because of the growing season of salmon, it is reasonable to assume the production process is not evenly distributed throughout the year, and we assume the cost function C is convex (Ahn and McQuoid, 2017). Similar to Antras et al. (2017), the demand curve takes the form of $Q^d = BP^{-\sigma}$ or $P = B(Q^d)^{-1/\sigma}$ with σ being greater than one because of the elastic demand for salmon in China (Chen and Garcia, 2016; Zhuang and Abbott, 2007).³ Prior to the political tension, China imported virtually all of its salmon from Norway. The present value of profit of a represented firm importing only from Norway before the political tension is:

$$\pi_1 = \max_{\{S_{n,t}\}_{t=1}^{t=\infty}} \sum_{t=1}^{\infty} \frac{1}{(1+r)^t} [p(S_{n,t})(S_{n,t}) - \tau_{n,l}C(S_{n,t})] \quad (11)$$

where $S_{n,t}$ represents salmon imported from Norway; P is the price function; and, $\tau_{n,l}$ represents the normal tariff equivalent of trade barriers on imports from Norway before the political tension.

Firms can still choose to expand their sourcing countries by paying a fixed cost of F_o :

$$\pi_2 = \max_{\{S_{n,t}, S_{o,t}\}_{t=1}^{t=\infty}} \sum_{t=1}^{\infty} \frac{1}{(1+r)^t} [p(S_{n,t} + S_{o,t})(S_{n,t} + S_{o,t}) - \tau_{n,l}C(S_{n,t}) - \tau_oC(S_{o,t})] - F_o \quad (12)$$

where $S_{o,t}$ represents salmon from other countries; P is the price function; and, τ_o represents the tariff equivalent of trade barriers on imports from other countries.

However, because of the political tensions, firms realize there will be a higher trade barrier importing from Norway that lasts for T periods; thus, the profit of importing only from Norway and multiple outsourcing is:

$$\pi_1^* = \max_{\{S_{n,t}\}_{t=1}^{t=\infty}} \sum_{t=1}^T \frac{1}{(1+r)^t} [p(S_{n,t})(S_{n,t}) - \tau_{n,h}C(S_{n,t})] + \sum_{t=T+1}^{\infty} \frac{1}{(1+r)^t} [p(S_{n,t})(S_{n,t}) - \tau_{n,l}C(S_{n,t})] \quad (13)$$

³ B here is a constant that governs the scale of demand.

$$\pi_2^* = \max_{\{S_{n,t}, S_{o,t}\}_{t=1}^{t=\infty}} \left\{ \sum_{t=1}^T \frac{1}{(1+r)^t} [p(S_{n,t} + S_{o,t})(S_{n,t} + S_o) - \tau_{n,h}C(S_{n,t}) - \tau_oC(S_{o,t})] + \sum_{t=T+1}^{\infty} \frac{1}{(1+r)^t} [p(S_{n,t} + S_{o,t})(S_{n,t} + S_o) - \tau_{n,l}C(S_{n,t}) - \tau_oC(S_{o,t})] - F_o \right\} \quad (14)$$

where $\tau_{n,h}$ represents the higher trade barriers for Norway that last for T periods because of the political tensions.

For simplicity, assuming firms are facing exactly the same demand function each period, we can get the optimal Norwegian salmon importing quantity under these two trade strategies:

$$S_{n,t}^1 = \begin{cases} S_{n,h}^1 & \text{if } t \leq T \\ S_{n,l}^1 & \text{if } t > T \end{cases} \quad (15)$$

$$S_{n,t}^2 = \begin{cases} S_{n,h}^2 & \text{if } t \leq T \\ S_{n,l}^2 & \text{if } t > T \end{cases} \quad (16)$$

Using the envelop theorem, we can get the following first-order conditions that explain the additional profit gain from sourcing from multiple exporters under political tension:

$$\frac{\partial \pi_2^* - \pi_1^*}{\partial F_o} = -1 \quad (17)$$

$$\frac{\partial \pi_2^* - \pi_1^*}{\partial \tau_{n,h}} = \frac{1 - (1+r)^{-T}}{r} [C(S_{n,h}^1) - C(S_{n,h}^2)] \quad (18)$$

$$\frac{\partial \pi_2^* - \pi_1^*}{\partial T} = \frac{\ln(1+r)(1+r)^{-T}}{r} [C(S_{n,h}^1) - C(S_{n,h}^2)] \quad (19)$$

Obviously, the first condition with respect to F_o is negative, meaning that higher fixed cost to find another supplier would erode the profit gain from sourcing from another exporter. The signs of the remaining two conditions depend on the sign of the cost differential $C(S_{n,h}^1) - C(S_{n,h}^2)$. We could show that this cost differential is positive and prove that $S_{n,h}^1 > S_{n,h}^2$ using proof by contradiction, since firms will choose to expand sourcing

countries if $\pi_2^* > \pi_1^*$. Because firms maximize profit, we know that, in equilibrium, the marginal cost of importing an additional unit of salmon must always equal the marginal revenue of it. Assume that $S_{n,h}^1 \leq S_{n,h}^2$, which suggests that under the multiple sourcing scenario the firm imports more quantity from Norway *and* buys from another country. Because of the convexity of cost function, the marginal cost of the multiple sourcing scenario with higher import quantity would be higher than that of importing only from Norway. This implies the marginal revenue of multiple sourcing is also higher than that of importing only from Norway. However, we know the cost function is convex with $C'(0) < C'(S_{n,h}^2)$ —firms will import positive amount of salmon from other countries as long as $\frac{\tau_{n,h}}{\tau_o} > \frac{C'(0)}{C'(S_{n,h}^2)}$. This implies a higher importing quantity of salmon in the multiple outsourcing scenario, for which, according to the elastic demand, the marginal revenue should be lower. Thus, our assumption of $S_{n,h}^1 \leq S_{n,h}^2$ must be wrong, and $S_{n,h}^1 > S_{n,h}^2$ is proven.

As a result, we could sign all three first-order conditions as follows:

$$\frac{\partial \pi_2^* - \pi_1^*}{\partial F_o} < 0 \quad (20)$$

$$\frac{\partial \pi_2^* - \pi_1^*}{\partial \tau_{n,h}} > 0 \quad (21)$$

$$\frac{\partial \pi_2^* - \pi_1^*}{\partial T} > 0 \quad (22)$$

The last two conditions suggest that a prolonged political tension, a higher T , or a rise in tariff-equivalent trade barrier $\tau_{n,h} - \tau_{n,l}$, would increase the profit gain resulting from sourcing from another country, which provides an incentive for firms to expand their sourcing countries and engage in import diversification. In this model, the tensions between Norway and China will raise the tariff equivalent of trade barriers $\tau_{n,h}$, which last for T periods. Both factors in this lasting political tension between China and Norway can generate enough space to allow firms to change trading strategies. In other words, whether a firm implements import diversification depends on how severely the political tension raises the cost and how long the tension lasts. Our finding of much larger trade responses for this long-term political tension is consistent with this theoretical result.

Intuitively, the only cost of using an import diversification strategy is the additional fixed cost to establish a new trading route. Once firms pay the fixed cost, they can reduce their average cost of production by using multiple inputs. This means that even after the political tensions, firms that have paid the fixed cost to establish another trading route do not have to incur that cost again, and some of them will continue to import from these new partners. This might explain our finding of the political hedging effect via the reduction in maximum share of fresh salmon imports from any country.

Finally, note that if we do not include fixed cost in the profit function, $\pi_2 \geq \pi_1$ will always hold, as long as τ_o does not exceed $\tau_{n,h}$ too much. As a result, the Norway exporters that once dominated the market could not retain that market share once China's importers accessed salmon from other countries. Once implemented, the import diversification strategy permanently changed the trade pattern. In the aggregate data, we see that Norwegian salmon had not restored its share in China's fresh salmon market even two years after the bilateral relationship normalized.

7 CONCLUSION

The political tensions between Norway and China following the award of the Nobel Peace Prize to Chinese dissident Liu Xiaobo resulted in a frozen bilateral relationship and an effective Norwegian fresh salmon sanction that lasted for over six years. Taking advantage of this long-term political sanction and leveraging firm-level data from all of China's seafood importers from 2007 to 2015, we provide evidence that these firms adapted their imports to this political sanction at both the intensive and extensive margin. Firms that imported Norwegian fresh salmon before 2010 saw a dramatic 89%-96% decline in fresh salmon imports from Norway; and, in contrast with previous findings, this effect is persistent rather than short-lived. We also find that as firms expanded trading routes and imports from countries other than Norway, they became more precautionary and lowered the maximum share of fresh salmon imports from any country, even if not Norway. Furthermore, unlike the findings in most consumer boycotts studies, we find that both politically influenced firms, such as China's state-owned enterprises, and privately owned enterprises adjusted their trading behavior and diversified their trade portfolios. Our heterogeneity analysis

also suggests that China's dramatic decrease in Norwegian fresh salmon imports were driven by large import reductions in firms with large import value, higher seafood import share, and more fresh salmon trading routes.

There are several limitations to our analysis. First, we cannot pinpoint the month of the importing trips, thus our annual data cannot uncover the dynamic and immediate responses following major events that may have further deteriorated or improved Norway-China relations. Second, our customs database contains a wealth of information on firms' import prices and quantities; however, it does not contain many firm characteristics, such as number of employees. We augment customs data with an auxiliary firm-level database that identifies firm ownership structure through database name searches using Tianyacha, a commercial Chinese firm database. We were able to match most, but not all, firms. We also use the value of firms' total imports as proxies for firm size. Finally, our data ended in 2015, which is before the normalization of China-Norway political relations, and we are unable to examine the persistence of these extensive- and intensive-margin effects after the six-year-long political tensions. We provided some suggestive evidence using aggregate monthly trade data that firms do not return to the pre-sanction import portfolio dominated by Norway.

Our paper has important implications in understanding the consequences of politically motivated trade policies. Our results show that the political sanctions on Norwegian fresh salmon imports led to a persistent shift in the fresh salmon market where competitors, such as Faroe Islands, Chile, and United Kingdom captured Norway's market share. This transition is costly for Norwegian fresh salmon firms—they experienced an average loss of 36.8 million Chinese Yuan following the sanction as compared to unaffected control firms.⁴

⁴For this calculation, we re-estimate equation (3) but assume all the time indicators equal to 1 if firms import goods after 2010. We use the log of import value of Norwegian fresh salmon or fresh salmon from any other source country as the dependent variable for treatment group. We multiply the relevant coefficient by the average fresh salmon import value before 2010 to get the average value reduction in Norwegian fresh salmon imports and average value gain in fresh salmon import from any other source country. We calculate the average loss by subtracting the average gain in fresh salmon import from any other source country from the average value reduction in Norwegian fresh salmon imports.

The persistent loss of Norway exports and the political hedging effect revealed through the lower maximum share of imports reveal that a significant degree of the loss due to this disruption is permanent. Finally, our heterogeneity analysis shows that this sanction hurts smaller firms more due to their lack of resources to build and expand on other trading routes.

Our paper suggests several fruitful avenues for future research. This is especially meaningful for the current world as political risks are rising globally. First, our findings of persistent trade responses to political sanctions contrast much of the previous literature, which calls for more analysis of consequential political disruptions of trade relationships, such as the ongoing U.S.-China trade war, as opposed to short-lived events like consumer boycotts. Second, due to data limitations, we cannot assess how firms' profits were impacted due to China's political sanction. With more detailed firm-level data, we could understand more of the mechanisms behind the behaviors of Norwegian fresh salmon firms during China's salmon sanction. Finally, it will also be worthwhile to examine how exporters from Norway to Chile coped with this significant trade disruption.

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TABLES

Table 1. Summary Statistics of China's Seafood Importers

	Firms N		Mean	S.D.	Median
Firms Importing Norwegian Fresh Salmon before 2010 (Treated Firms)					
Import Value	49	347	1,967,928	4,208,354	459,659
Import Quantity	49	347	251,564	533,907	56,929
Total Value	49	176	3,879,950	7,508,449	1,017,206
Seafood Share of All Imports	49	49	.65	.44	.93
No. of Seafood Trading Routes before 2010	49	49	4.70	7.64	4
No. of Import Source Countries					
Before 2010	49	101	1.41	.79	1
After 2010	27	75	2.67	1.66	2
Maximum Import Share for Any Source Country					
Before 2010	49	101	.98	.06	1
After 2010	27	75	.82	.20	.89
Firms Importing North American Shrimp (Control Firms)					
Import Value	527	1,582	769,086	1,883,375	192,948
Import Quantity	527	1,582	106,822	306,247	13,890
Total Value	527	1,116	1,090,228	2,830,810	245,034
Seafood Share of All Imports	527	527	.75	.37	.97
No. of Seafood Trading Routes before 2010	166	166	5.43	13.20	7
No. of Import Source Countries					
Before 2010	166	284	1.06	.24	1
After 2010	442	832	1.19	.39	1
Maximum Import Share for Any Source Country					
Before 2010	166	284	.96	.11	1
After 2010	442	832	.90	.17	1

Notes: Table 1 presents the number of firms, observation, means, standard deviations and medians. The upper panel presents raw summary statistics for the sample of firms importing Norwegian fresh salmon before 2010. The lower panel presents raw summary statistics for the sample of firms importing North American shrimps. Our study period is from 2007 to 2015.

Table 1: Summary Statistics of China's Seafood Importers (Continued)

	Firms N		Mean	S.D.	Median
All Seafood Importers (Full Sample)					
Imports Value	6,101	74,221	588,315	2,236,063	89,411
Import Quantity	6,101	74,221	295,138	1,483,840	38,000
Total Value	6,101	29,108	5,263,792	1.50e+07	618747
Seafood Share of All Imports	6,101	6,101	.58	.44	.82
No. of Seafood Trading Routes before 2010	3,260	3,260	5.93	8.41	2
No. of Import Source Countries					
Before 2010	3,260	6,498	2.81	3.28	1
After 2010	4,323	9,359	2.66	3.02	1
Maximum Import Share for Any Source Country					
Before 2010	3,260	6,498	.75	.26	.81
After 2010	4,323	9,359	.76	.26	.84
Firms Importing Fresh Salmon from Countries other than Norway before the Sanction (Alternative Control Firms)					
Import Value	171	458	955,595	1,817,125	247,261
Import Quantity	171	458	112,843	216,563	29,762
Total Value	171	282	1,551,996	3,187,835	348,753
Seafood Share of All Imports	171	171	.69	.42	.99
No. of Seafood Trading Routes before 2010	17	17	8.47	9.05	6
No. of Import Source Countries					
Before 2010	17	17	1.06	.24	1
After 2010	158	265	1.64	1.15	1
Maximum Import Share for Any Source Country					
Before 2010	17	17	.97	.12	1
After 2010	158	265	.91	.18	1

Notes: Table 1 presents the number of firms, observation, means, standard deviations and medians. The upper panel presents raw summary statistics for the sample of firms in seafood industry. The lower panel presents raw summary statistics for the sample of other fresh salmon firms that didn't import Norwegian fresh salmon before 2010. Our study period is from 2007 to 2015.

Table 2. Intensive-margin Impacts of China's 2010 Salmon Sanction Without Controlling for Selection Bias

	(1)Import Value	(2)Import Quantity	(3)No. of Transactions
<i>3 years before event</i>	-1.418 (1.456)	-1.461 (1.467)	-.024 (.024)
<i>2 years before event</i>	.001 (.535)	-.010 (.568)	-.025 (.025)
<i>1 year before event</i>	.307 (.398)	.327 (.400)	-.022 (.021)
<i>Year of event</i>			
<i>1 year after event</i>	-2.317*** (.554)	-2.314*** (.550)	-.042 (.041)
<i>2 years after event</i>	-1.739*** (.575)	-1.476*** (.568)	-.055 (.053)
<i>3 years after event</i>	-3.122*** (.700)	-3.102*** (.664)	-.028 (.027)
<i>4 years after event</i>	-2.826*** (.647)	-2.843*** (.649)	-.027 (.027)
<i>5 years after event</i>	-3.907*** (.710)	-3.696*** (.687)	-.028 (.027)
Firm FE	Yes	Yes	Yes
Port-by-year FE	Yes	Yes	Yes
Observations	1,496	1,496	989
N (firms)	567	567	567
Adjusted R^2	0.44	0.61	0.47

Notes: Table 2 presents our event study estimators from equations (1) three years before and five years after China's Norwegian salmon sanction. Standard errors are clustered by firms. Regressions (1)–(2) include firm fixed effects and port-by-year fixed effects, except where otherwise noted. Regressions (3) only include firm fixed effects. Data cover the years 2007–2015. Asterisks denote p-value < 0.10 (*), < 0.05 (**), or < 0.01 (***).

Table 3. Selection Bias-Corrected Intensive-margin Impacts of China's 2010 Salmon Sanction

	(1)Import Value	(2)Import Quantity	(3)No. of Transactions
<i>3 years before event</i>	-1.439 (1.477)	-1.488 (1.509)	.056 (.104)
<i>2 years before event</i>	-.008 (.562)	-.083 (.589)	.074 (.097)
<i>1 year before event</i>	.300 (.416)	.333 (.429)	-.045 (.090)
<i>Year of event</i>			
<i>1 year after event</i>	-2.228*** (.545)	-2.228*** (.540)	-.012 (.092)
<i>2 years after event</i>	-1.853*** (.584)	-1.600*** (.576)	-.191** (.090)
<i>3 years after event</i>	-2.921*** (.736)	-2.918*** (.706)	-.025 (.094)
<i>4 years after event</i>	-2.623*** (.644)	-2.641*** (.656)	-.005 (.101)
<i>5 years after event</i>	-3.456*** (.709)	-3.246*** (.736)	.005 (.181)
$\hat{\lambda}_{i,2007}$	-.413 (.537)	-.831 (.700)	-.340*** (.081)
$\hat{\lambda}_{i,2008}$	-.162 (.610)	-.767 (.794)	-.353*** (.084)

Table 3. Selection Bias-Corrected Intensive Margin Impacts of China's 2010 Salmon Sanction (Continued)

	(1) Import Value	(2) Import Quantity	(3) No. of Transactions
$\hat{\lambda}_{i,2009}$	-.050 (.413)	.089 (.567)	-.263*** (.099)
$\hat{\lambda}_{i,2010}$	-1.094*** (.386)	-1.039** (.480)	-.356*** (.094)
$\hat{\lambda}_{i,2011}$	-.668 (.474)	-.565 (.464)	-.474*** (.109)
$\hat{\lambda}_{i,2012}$	-.892* (.486)	-.817 (.505)	-.309*** (.124)
$\hat{\lambda}_{i,2013}$	-1.275*** (.474)	-1.274*** (.469)	-.452*** (.130)
$\hat{\lambda}_{i,2014}$	-.440 (.355)	-.458 (.316)	-.471*** (.125)
$\hat{\lambda}_{i,2015}$	-1.164** (.584)	-1.195** (.566)	-.638*** (.184)
Firm FE	Yes	Yes	Yes
Port-by-year FE	Yes	Yes	Yes
Observations	1,496	1,496	989
N (firms)	567	567	567
Adjusted R^2	0.45	0.62	0.51

Notes: Table 3 presents our event study and inverse mills ratio estimators from equations (3) three years before and five years after China's Norwegian salmon sanction. Standard errors are clustered by firms. Regressions (1)–(2) include firm fixed effects and port-by-year fixed effects, except where otherwise noted. Regressions (3) only include firm fixed effects. Data cover the years 2007–2015. Asterisks denote p-value < 0.10 (*), < 0.05 (**), or < 0.01 (***).

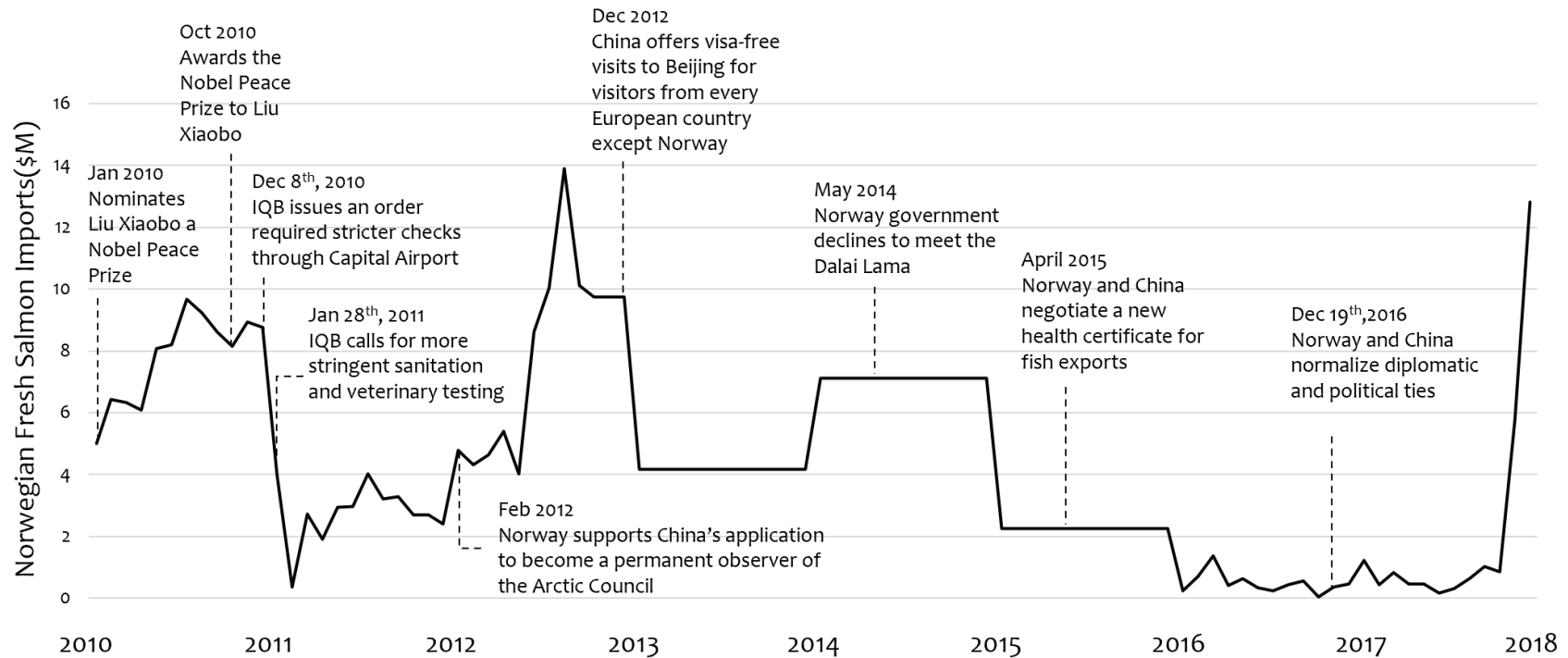
Table 4. Heterogeneous Impacts of China's 2010 Salmon Sanction

	(1) Seafood Imports > 50% of Total Imports	(2) Firms Imports Above Average	(3) Imports from Norway and Other Countries	(4) State-owned Firms
<i>3 years before event</i>	-1.904** (.750)	-1.865** (.735)	-1.125 (.774)	.648 (1.792)
<i>2 years before event</i>	-1.707*** (.539)	-.758 (.614)	-.615 (.574)	1.712 (.846)
<i>1 year before event</i>	-.690 (.608)	-.102 (.594)	-.413 (.555)	.701 (.432)
<i>Year of event</i>				
<i>1 year after event</i>	-.826 (.572)	-.998* (.559)	-.594 (.504)	-.496 (.886)
<i>2 years after event</i>	-1.314*** (.496)	-.998* (.533)	-.988** (.480)	-.126 (.910)
<i>3 years after event</i>	-1.596*** (.534)	-1.229** (.595)	-.878* (.533)	.104 (.934)
<i>4 years after event</i>	-1.593*** (.514)	-1.439*** (.553)	-1.391*** (.498)	.158 (.927)
<i>5 years after event</i>	-1.755*** (.550)	-2.005*** (.550)	-1.624*** (.515)	.407 (.933)
Firm FE	Yes	Yes	Yes	Yes
Port-by-year FE	Yes	Yes	Yes	Yes
Observations	5,648	5,648	5,648	5,648
N (firms)	567	567	567	567
Adjusted R^2	0.96	0.96	0.96	0.96

Notes: Table 4 presents our event study estimators from equation (10) three years before and five years after the Norwegian salmon sanction. Standard errors are clustered by firms. Regressions include firm fixed effects and port-by-year fixed effects, except where otherwise noted. See text for details. Data cover the years 2007–2015. Asterisks denote p-value < 0.10 (*), < 0.05 (**), or < 0.01 (***).

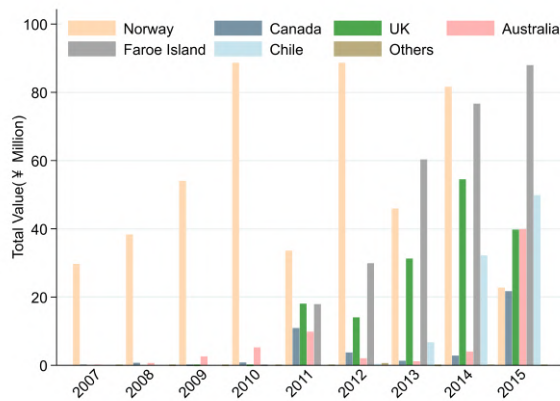
FIGURES

Figure 1. Timeline of China-Norway Fresh Salmon Trade Disruptions (2010–2017)

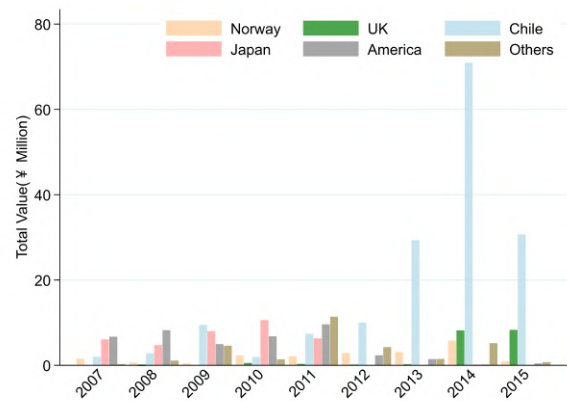


Notes: Figure 1 plots the 2010–2017 monthly Norwegian fresh salmon imports obtained from UN Comtrade. Given UN Comtrade only provides annual data from 2013 to 2015, we evenly distribute the annual imports to each month for the 2013–2015 period.

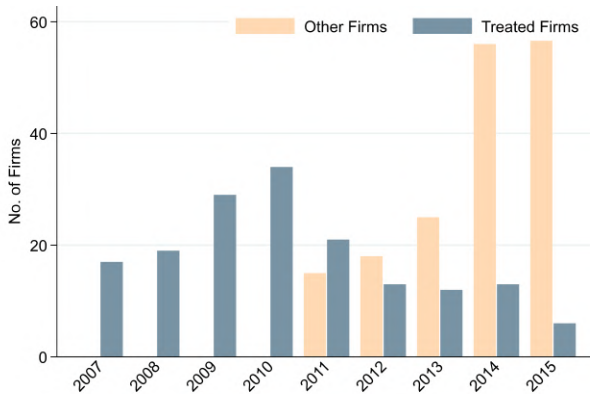
Figure 2. Total Imports and Number of China of Firms For All Chinese Salmon Importers (2007–2015)



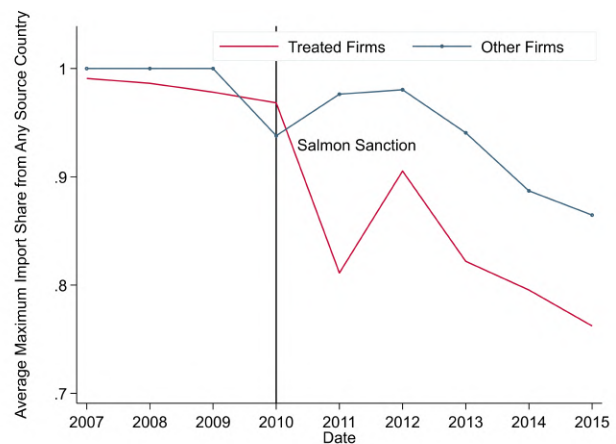
(a) Total Value of China's Fresh Salmon Imports



(b) Total Value of China's Frozen Salmon Imports

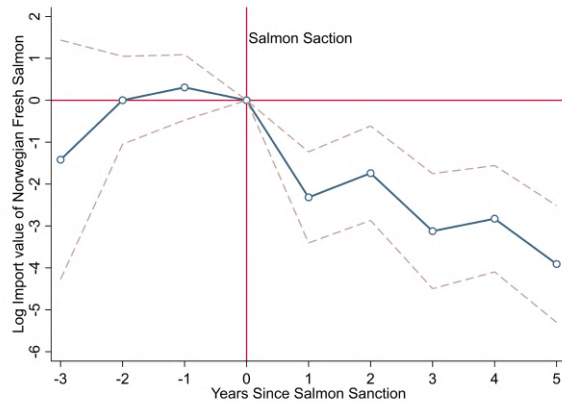


(c) Number of Firms Importing Norwegian Fresh Salmon

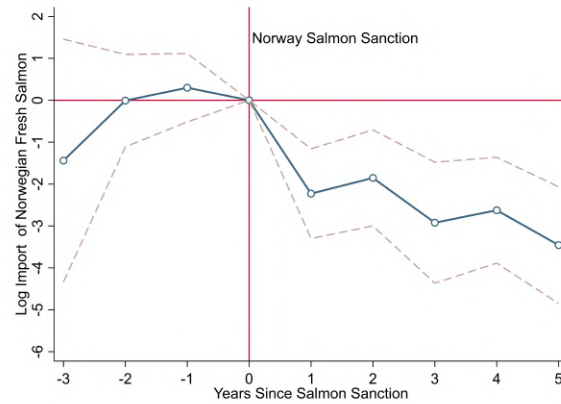


(d) Average Maximum Import Share from Any Source Country

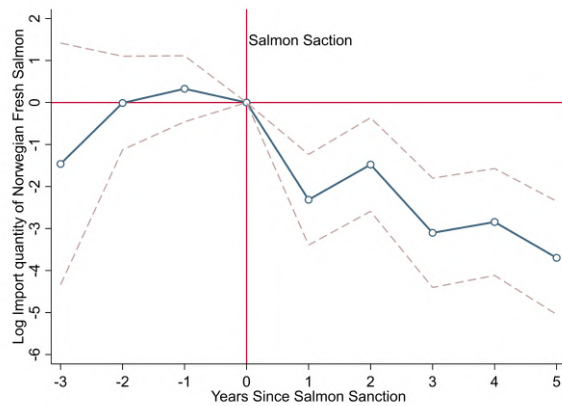
Figure 3. Event Study Estimate Results of the Intensive-margin Impacts on Norwegian Fresh Salmon Imports by Treated Firms



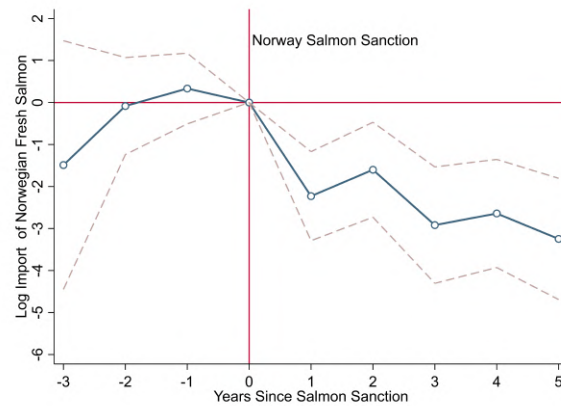
(a) Log Value of Imports (uncorrected)



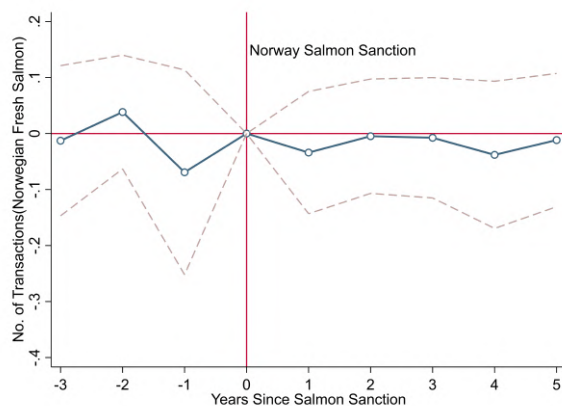
(b) Log Value of Imports (corrected)



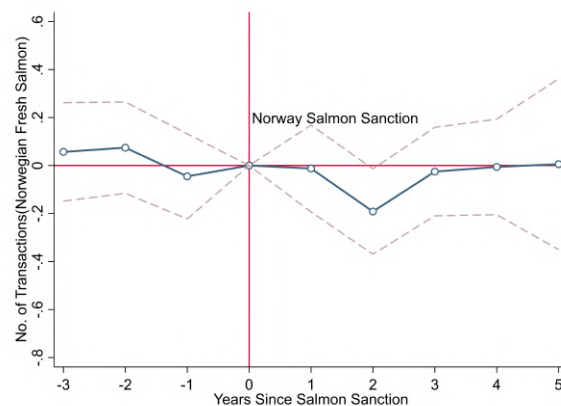
(c) Log Quantity of Imports (uncorrected)



(d) Log Quantity of Imports (corrected)



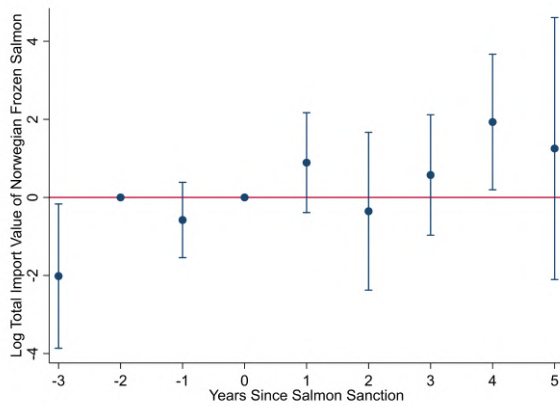
(e) Number of Transactions (uncorrected)



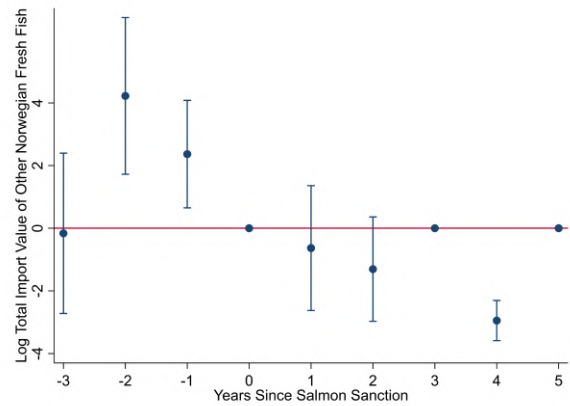
(f) Number of Transactions (corrected)

Notes: Figure 2 shows the results of event-study estimates from equations (1) and (3) in which the dependent variables are import value, import quantity, and the number of transaction for each firm. The control group is firms that imported North American shrimp from 2007 to 2015.

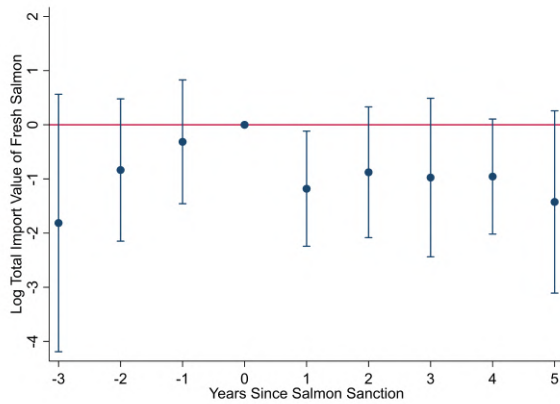
Figure 4. Trade Diversion Impacts and Total Fresh Salmon and Seafood Impacts



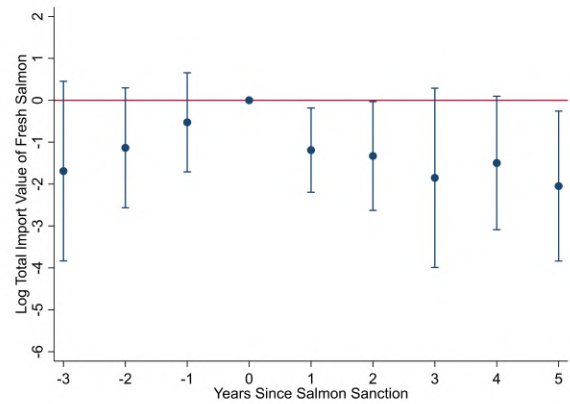
(a) Norwegian Frozen Salmon Imports



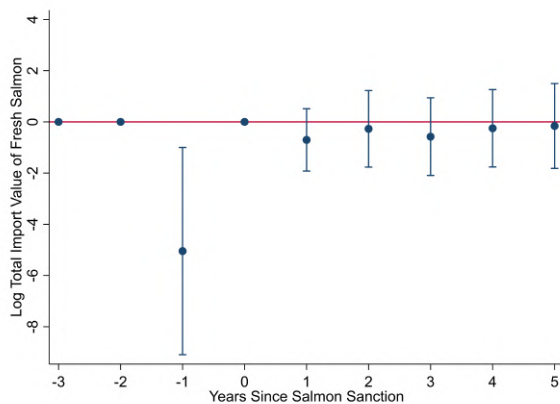
(b) Other Norwegian Fresh Fish Imports



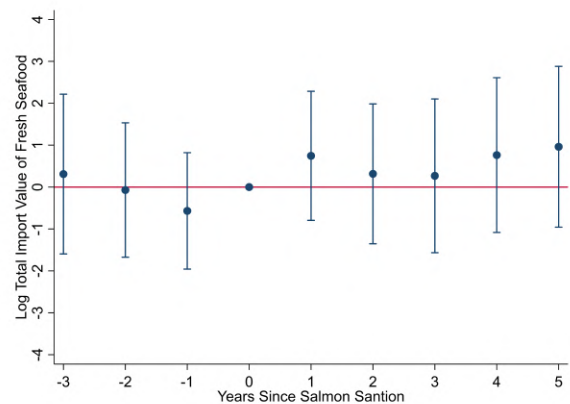
(c) Total Fresh Salmon Imports for Treated Firms



(d) Total Seafood Imports for Treated Firms

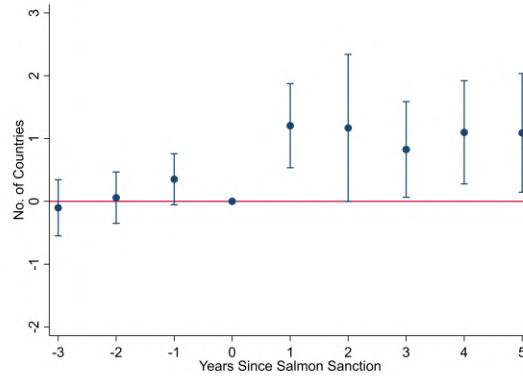


(e) Total Fresh Salmon Imports for Control Firms

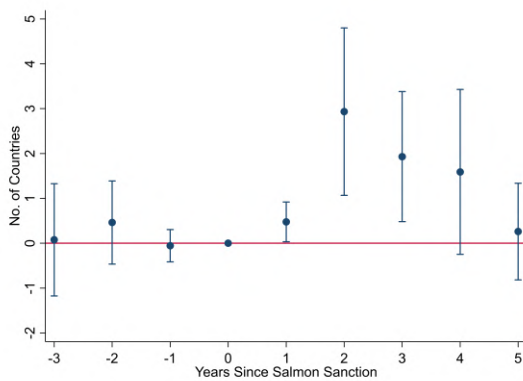


(f) Total Seafood Imports for Control Firms

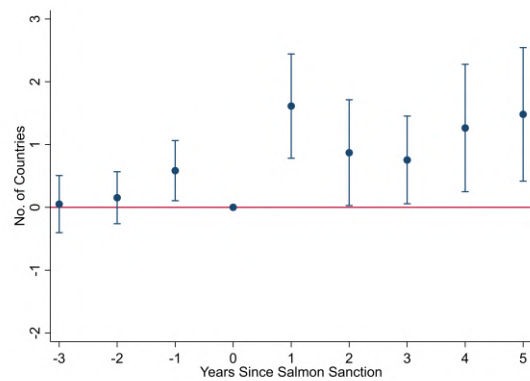
Figure 5. Extensive-margin Impacts on the Number of Trading Partners and Maximum Share Imported from Any Country



(a) Number of Countries Firms Imported Fresh Salmon From

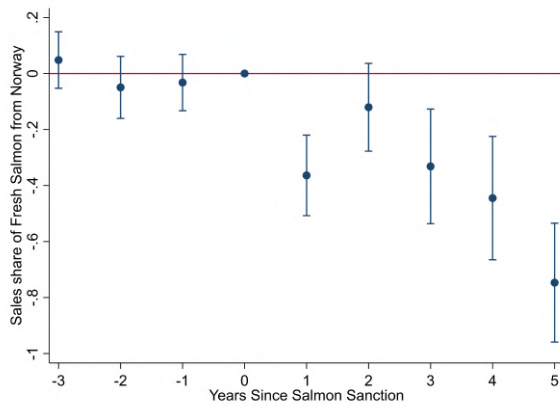


(b) Number of Countries Firms Import Fresh Salmon From (Only Import from Norway)

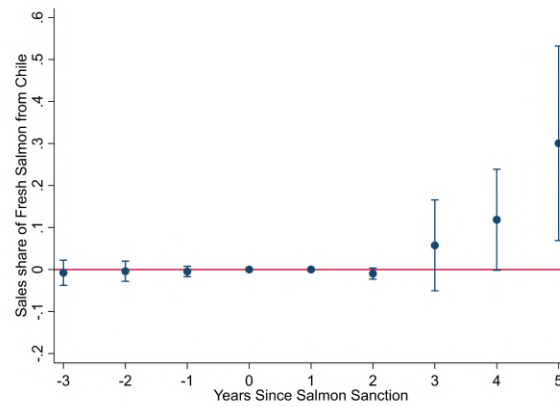


(c) Number of Countries Firms Import Fresh Salmon From (Import from Norway and Other Countries)

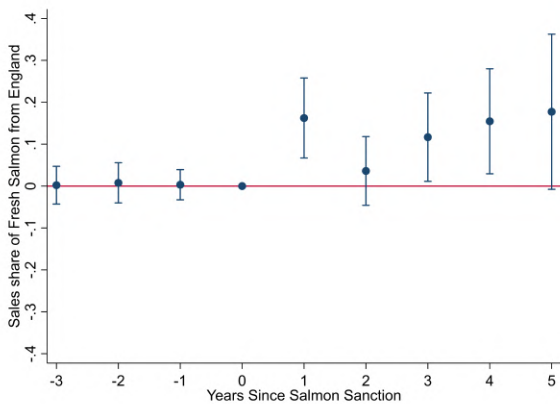
Figure 6. Extensive-margin Impacts on Fresh Salmon Import Share by Source Countries



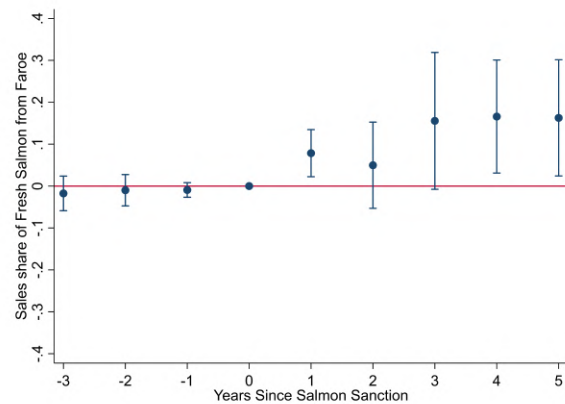
(a) Norway



(b) Chile

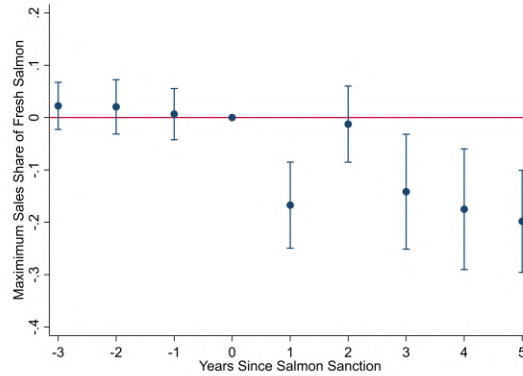


(c) United Kingdom

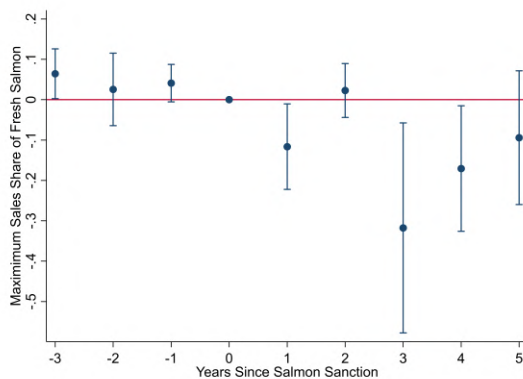


(d) Faroe Islands

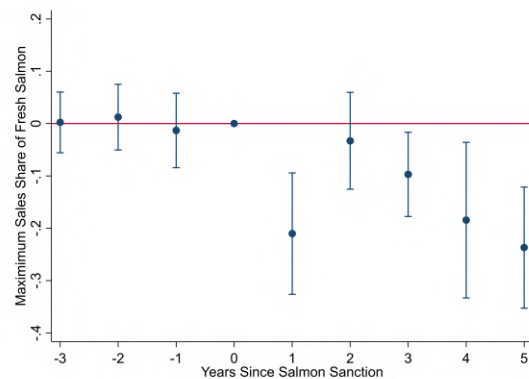
Figure 7. Extensive-margin Impacts of Number of Trading Partners and Maximum Share Imported from Any Country



(a) Maximum Fresh Salmon Import Share for Any Source Country



(b) Maximum Fresh Salmon Import Share for Any Source Country (Only Import from Norway)



(c) Maximum Fresh Salmon Import Share for Any Source Country (Import from Norway and Other Countries)

**How do Firms Respond to Political Tensions?
Evidence from China's Food Importers**

Haoran Li, Xibo Wan, Wendong Zhang

Appendices for Online Publication

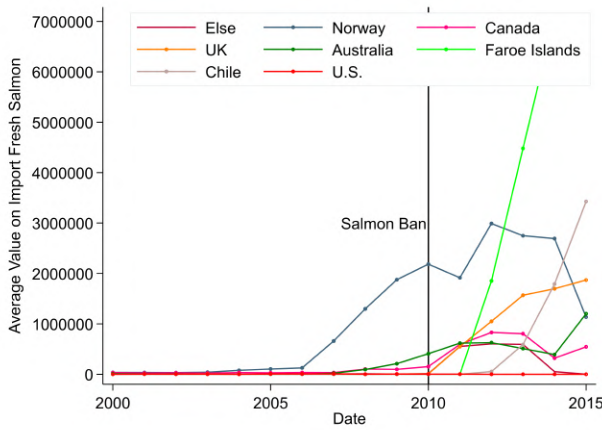
Online Appendix A ADDITIONAL EVIDENCE

Table A1. Summary Statistics, Norwegian Fresh Salmon and Controls

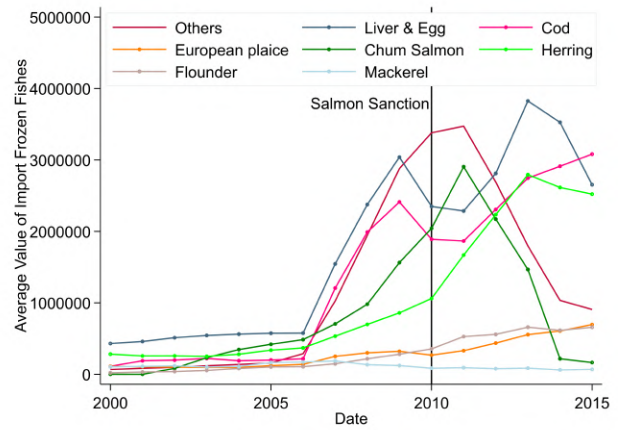
	Norwegian Fresh Salmon	North American Shrimp	North American Crab	North American Other Aquatics	Russian Frozen Herring
Seafood Share of All Imports	.65	.75	.79	.73	.86
Number of Seafood Trading Routes	4.70	5.43	6.11	4.30	5.35
State-owned	.12	.08	.09	.11	.16
Transport by Sea	.57	.63	.62	.60	.62
Maximum Import Share	.98	.90	.78	.82	.89

Notes: Table A1 presents the firm characteristics of treatment and alternative control groups from 2007 to 2010.

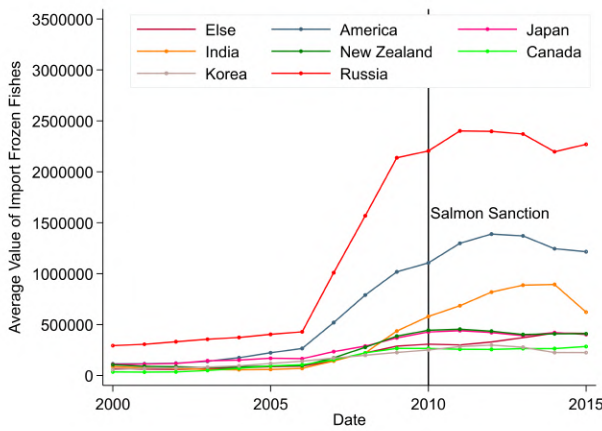
Figure A1. Import Value Trend of Seafood Products



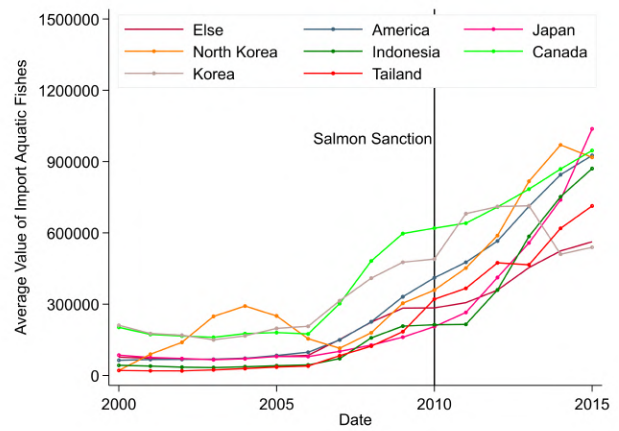
(a) Fresh Salmon (Treated Firms)



(b) Russian Frozen Fishes (Control Groups)

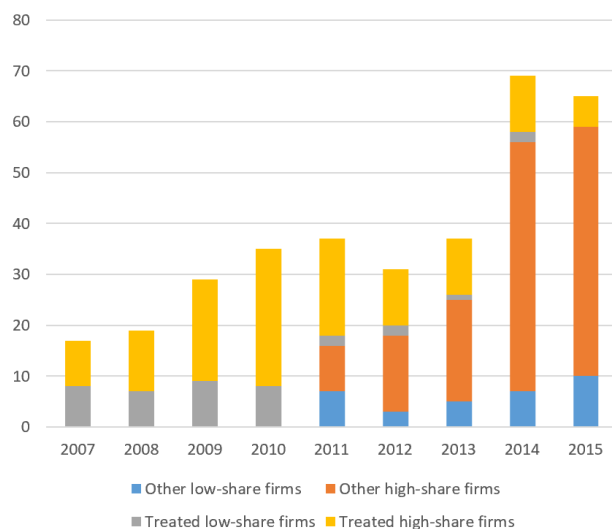


(c) Frozen Fishes (Control Groups)

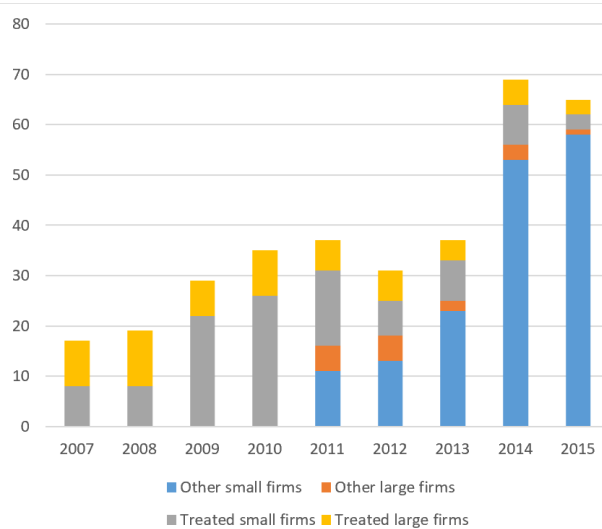


(d) Aquatics (Control Groups)

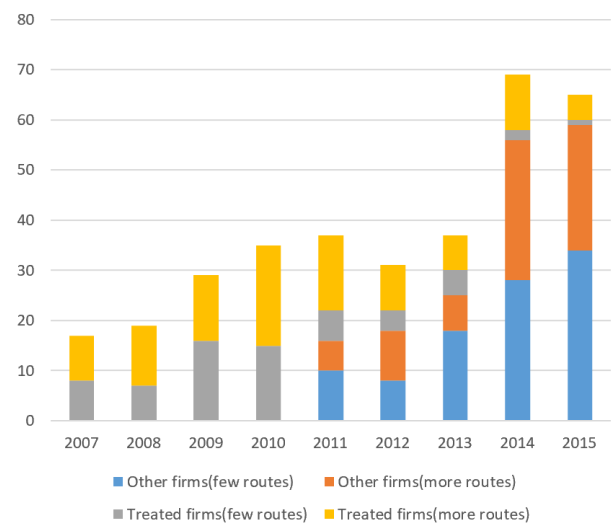
Figure A2. Change in the Number of Norwegian Fresh Salmon Firms



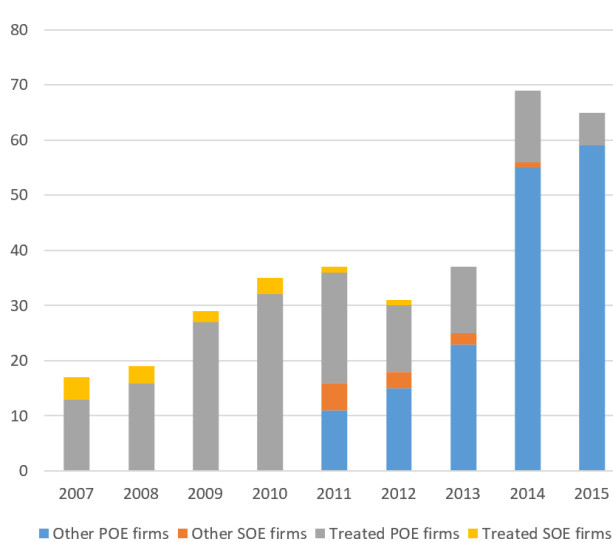
(a) Seafood Share of All Imports



(b) Seafood Import Value Above Average



(c) Number of Trading Countries Above Average



(d) State-Owned vs. Privately Owned

Figure A3. Characteristic Comparison of Entering and Exiting Firms

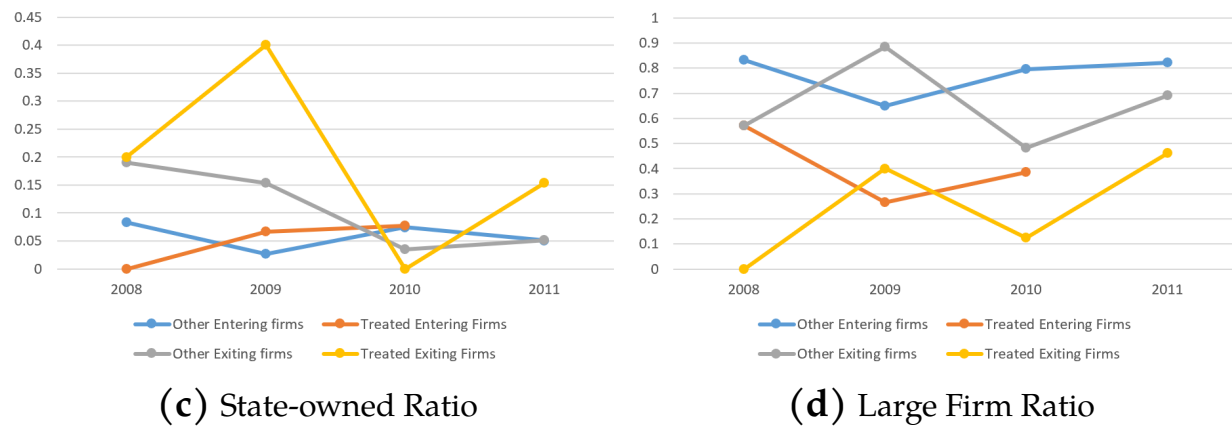
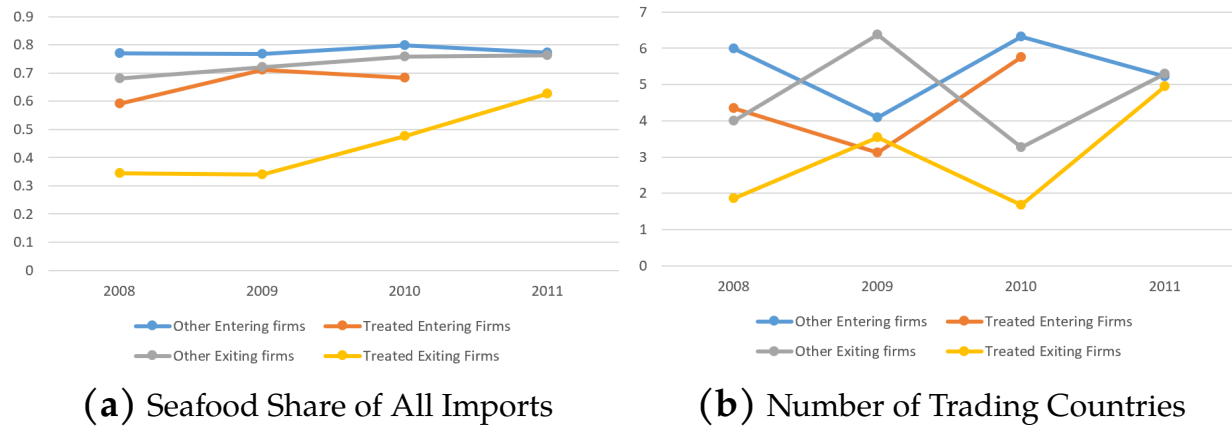
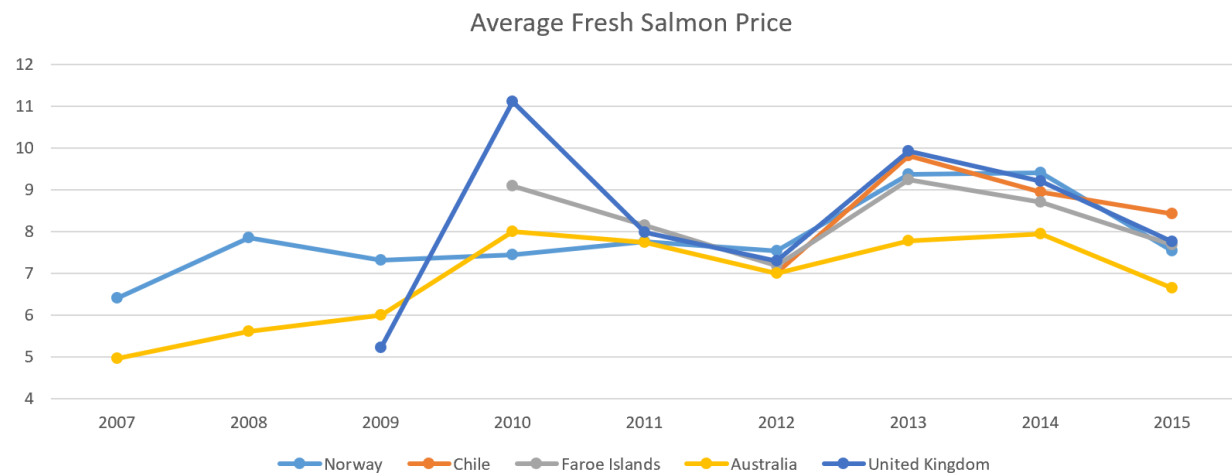


Figure A4. Average Price Trends in Fresh Salmon Imports in Main Source Countries



Online Appendix B ROBUSTNESS CHECKS

Table B1. Selection Bias Tests

	(1)	(2)
<i>Remain_{i,2009}</i>	.398*** (.124)	
<i>Remain_{i,2011}</i>		.657*** (.146)
<i>3 years before event</i>		-1.593 (1.507)
<i>2 years before event</i>	-.012 (.554)	-.181 (.534)
<i>1 year before event</i>	.524 (.401)	.009 (.392)
<i>Year of event</i>		
<i>1 year after event</i>	-2.191*** (.571)	-2.215*** (.530)
<i>2 years after event</i>	-1.312** (.565)	-1.718*** (.562)
<i>3 years after event</i>	-2.697*** (.686)	-3.177*** (.669)
<i>4 years after event</i>	-2.421*** (.644)	-2.589*** (.672)
<i>5 years after event</i>	-3.436*** (.746)	
Firm FE	Yes	Yes
Port-by-year FE	Yes	Yes
Observations	1,417	1,247
N (firms)	567	567
Adjusted R^2	0.46	0.50

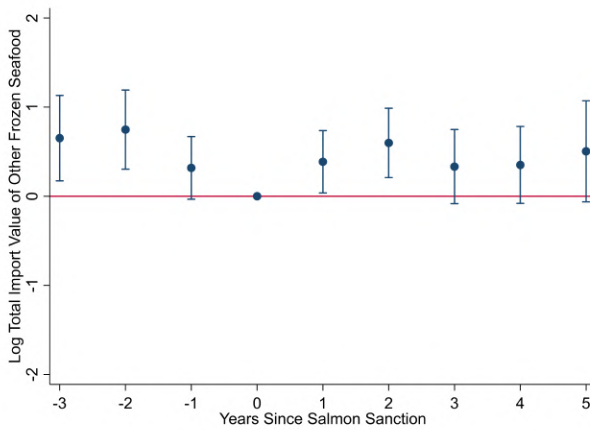
Notes: Table B1 presents our event study estimators adding selection indicators three years before and five years after the Norwegian salmon disruption following equation (1). Standard errors are clustered by firms. Regressions include firm fixed effects and port-by-year fixed effects, except where otherwise noted. Data covers the years 2007–2015. Asterisks denote p-value < 0.10 (*), < 0.05 (**), or < 0.01 (***).

Table B2. Selection Bias-Corrected Intensive-margin Impacts: First Stage Estimates

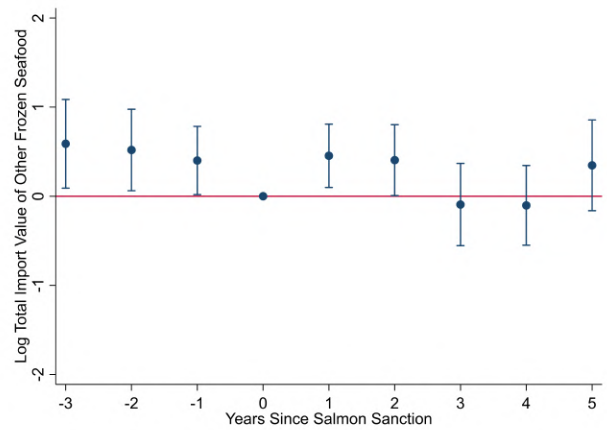
$\overline{Remain}_{i,t}$	2007	2008	2009	2010	2011	2012	2013	2014	2015
$\overline{seafood}_i$	-1.536*** (.358)	-1.827*** (.423)	-1.357*** (.334)	-1.363*** (.356)	-1.879*** (.454)	-1.462*** (.314)	-1.414*** (.372)	-1.509*** (.367)	-1.351*** (.325)
\overline{num}_i	-.175*** (.039)	-.099*** (.038)	-.229*** (.044)	-.157*** (.041)	-.160*** (.040)	-.133*** (.029)	-.120*** (.032)	-.238*** (.038)	-.154*** (.028)
$seafood_{i,t}$	2.267*** (.338)	2.438*** (.387)	2.109*** (.298)	2.028*** (.315)	2.743*** (.417)	2.073*** (.278)	2.267*** (.339)	2.433*** (.332)	2.127*** (.291)
$num_{i,t}$.148*** (.033)	.099*** (.032)	.185*** (.038)	.180*** (.035)	.162*** (.033)	.183*** (.028)	.187*** (.031)	.257*** (.034)	.256*** (.031)
Observations	592	587	591	597	620	659	663	682	660
Pseudo R^2	0.41	0.36	0.37	0.39	0.45	0.35	0.39	0.45	0.46

Notes: Table B2 presents our probit estimators from equation (2) from 2007 to 2015 using the binary indicator $\overline{Remain}_{i,t}$ as the dependent variable denoting that firm i is still importing fresh salmon in year t . Asterisks denote p-value < 0.10 (*), < 0.05 (**), or < 0.01 (***).

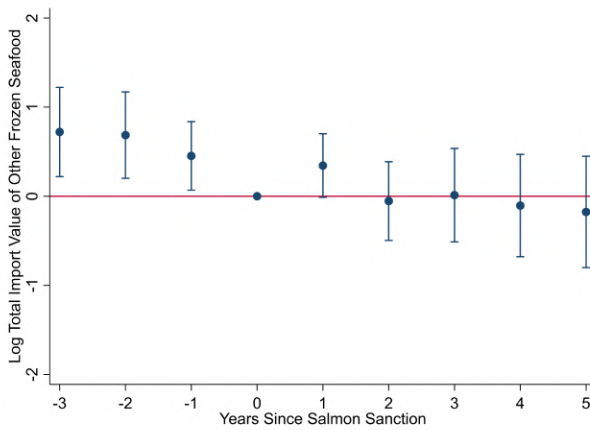
Figure B1. Placebo Tests of the Sanction's Impact on Other Seafood Products from Unaffected Firms



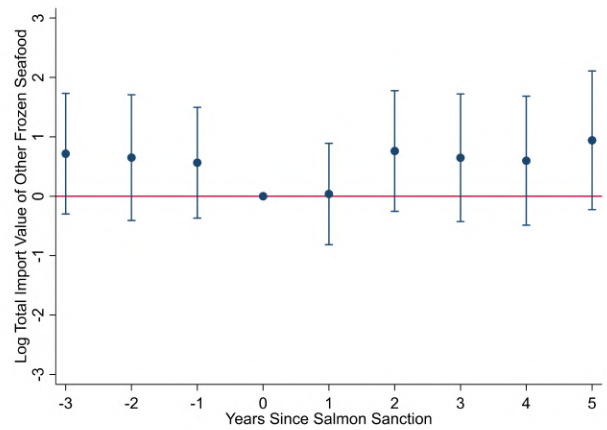
(a) Treatment: Frozen Cod



(b) Treatment: Frozen Europe Plaice

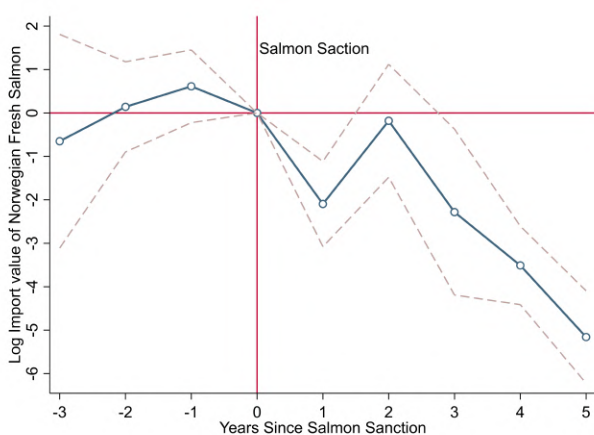


(c) Treatment: Frozen Hairtail

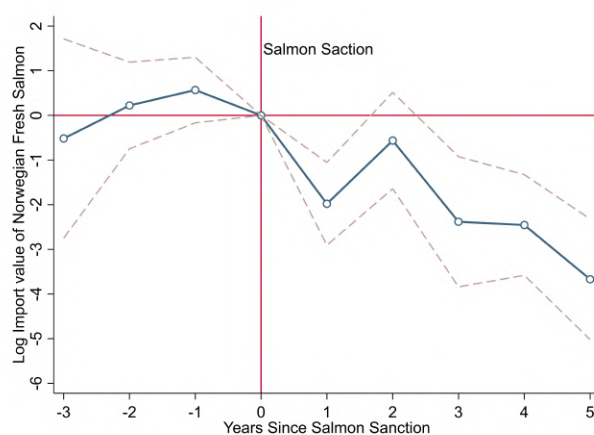


(d) Treatment: Frozen Flounder

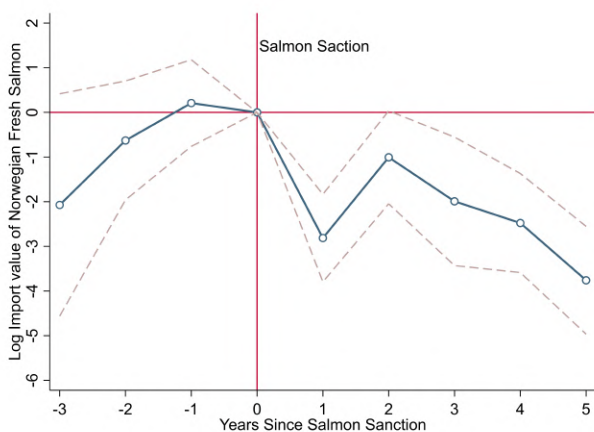
Figure B2. Direct Impacts of China's 2010 Salmon Sanction using Alternative Control Firms



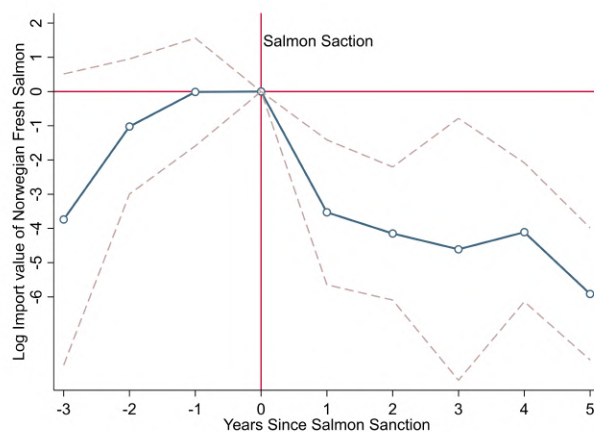
(a) Control: Firms Importing Asian Shrimp



(b) Control: Firms Importing North American and Asian Shrimp

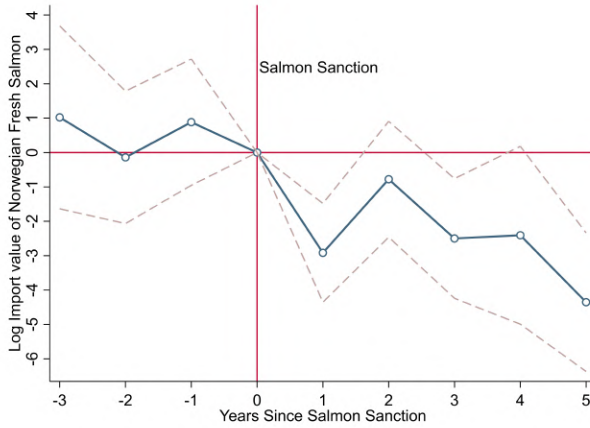


(c) Control: Firms Importing North American Crab

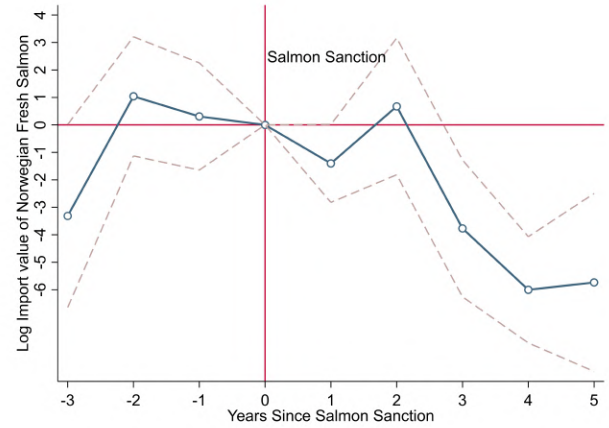


(d) Control: Firms Importing Russian Frozen Herring

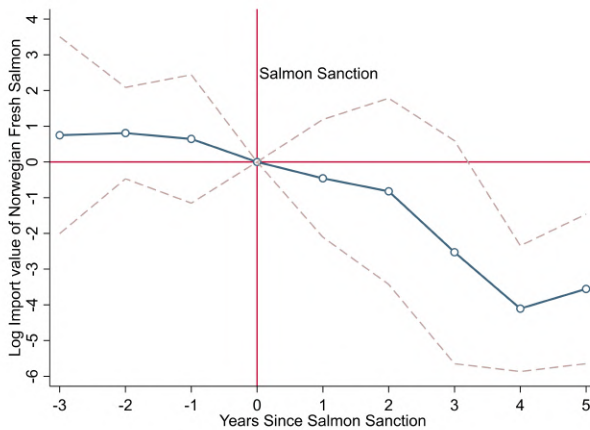
Figure B3. Direct Impacts of China's 2010 Salmon Sanction using Alternative Seafood Product Importing Firms as Controls



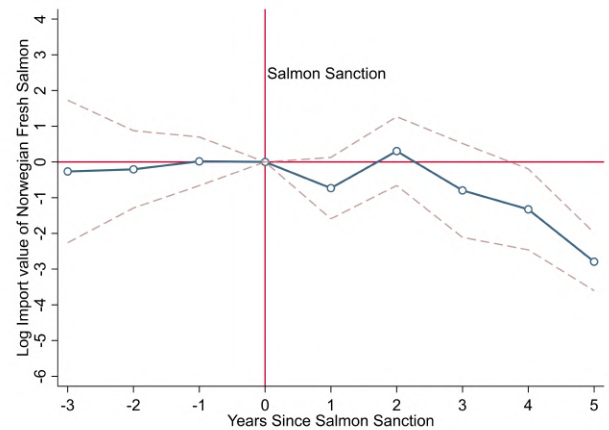
(a) Control: Firms Importing Fresh Salmon not from Norway



(b) Control: Firms Importing Norwegian Non-fresh Fishes other than Salmon

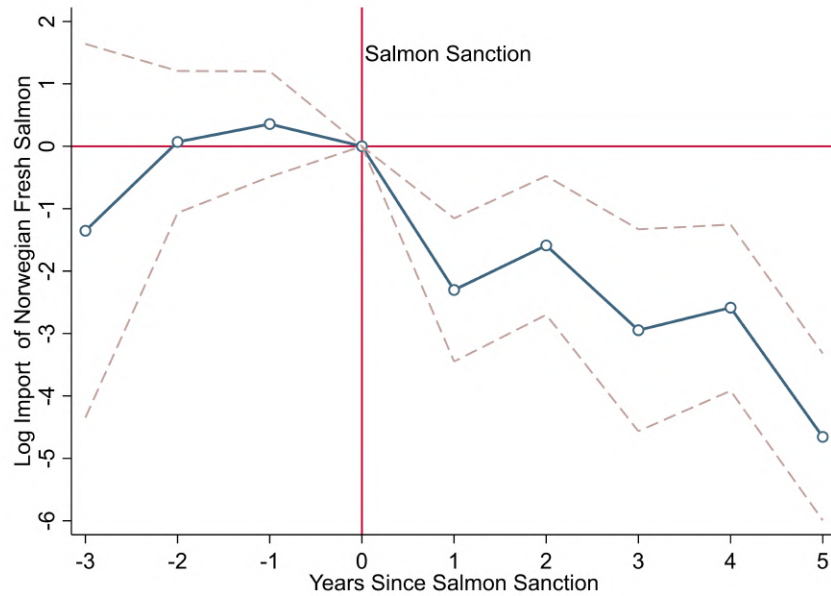


(c) Control: Firms Importing Frozen Fishes other than Salmon and not from Norway

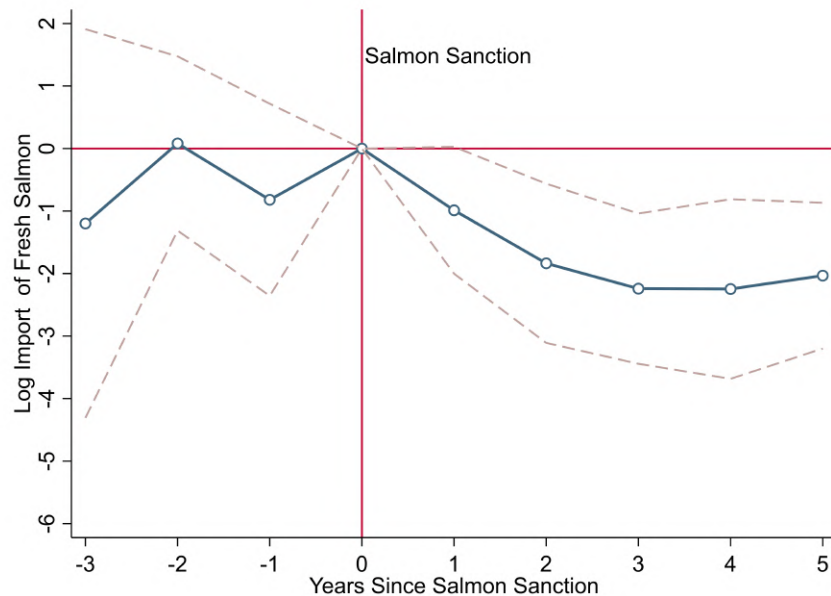


(d) Control: Firms Importing Aquatic Fishes other than Salmon and not from Norway

Figure B4. Direct Impacts of China's 2010 Salmon Sanction using Alternative Treatment or Control Definition



(a) Control: Firms Importing North American Shrimp before 2010



(b) Treatment: Firms Importing Fresh Salmon before 2010